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THE GLOBAL VOICE FOR PASSIVE & ACTIVE FIRE PROTECTION

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Front Cover Picture: Draeger Gas Detection Equipment. Pic courtesy of Draeger Safety UK Limited

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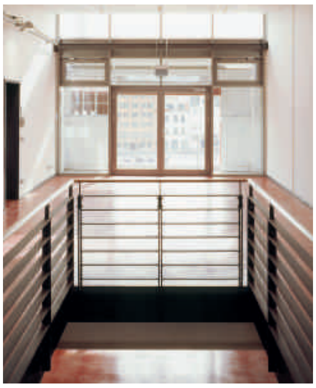
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Royal Festival Hall Renovation Incorporates Full Fire Protection by Notifier® by Honeywell

Advance Specialist Systems installs fire detection and voice alarm system for Grade 1 listed building in £700,000 contract

LEADING NOTIFIER Fire Systems Engineered Systems Distributor (ESD), Advance Specialist Systems, has been selected to provide full fire safety protection as part of the new £70 million refurbishment programme at the Grade 1 listed Royal Festival Hall, one of London's premier concert venues.

The contract, worth £700,000, includes the provision of comprehensive fire detection and public address/voice alarm equipment for the Royal Festival Hall and integrates with the new adjacent Extension Building, which houses both office staff and technical facilities.

The Royal Festival Hall, opened in 1951, forms the centerpiece of the prestigious South Bank Centre (SBC) arts complex and includes a 2,900 seat auditorium, providing concerts by the world's finest orchestras and hosts rock, jazz, dance and world music performers. The major two-year renovation programme is currently well underway and the Hall is due to re-open in June 2007.

Following a full tender process, major contractor, ISG InteriorExterior selected Advance Specialist Systems to install Notifier life safety equipment, including a network of five ID3000 fully addressable alarm panels with more than 1,000 detectors, together with a network-based repeater, four large networked public address/voice alarm racks and UniNet-ID graphics-based alarm reporting system.

Easy-to-use solution

"We required a robust, technically advanced detection and audio solution from a proven stable for this high profile development, which includes complex cause and effect programmes," confirms Colin Restall, head of security and health and safety, SBC. "Notifier and Advance provided the ideal combination of leading-edge technology and track record of success to meet our demanding requirements within the installation constraints of the Royal Festival Hall's listed status."

For his part, Nigel Pollard, business manager, Notifier Fire Systems, believes that, "the ID3000 intelligent fire alarm panel is perfectly suited to large public facilities such as the Royal Festival Hall, as its advanced, third party-certified, engineered system design not only offers a high level of functionality but is easy to install, programme and operate.

"Similarly, the Notifier UniNet-ID incorporates next-generation technology to provide integrated fire, security, CCTV and access control across the whole Royal Festival Hall site."

Voice Alarm Protection

The development also includes full voice alarm protection for the public access areas, which annually attract some 2.5 million visitors from around the world. "Voice messaging has become an increasingly important as part of an efficient evacuation strategy," confirms Advance Specialist Systems. "In response, the Notifier solution incorporates the recently-developed ID PAVA system as part of a comprehensive fire detection and alarm solution.

"As a result of the need to preserve the building's Grade 1 listed status, to the casual eye much of the original building will look much as before. However, a significant – if unseen – benefit is that the public and staff alike will be protected by the very latest in life safety systems."

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General purpose sounder beacon from Klaxon Signals

THE LATEST addition to the Sonos range of sounders, beacons and sounder beacons from sound signalling specialist Klaxon Signals is a general purpose AC electronic unit designed for fire, security and industrial applications.

Installation is quick and easy with smooth flow cabling and no locking screw required, and the full-faced translucent beacon case provides a greater spread of light when compared with standard and competitor beacon products.

Sonos AC sounder beacons are weatherproof to IP65 and can be used in all locations both indoors and outdoors. Dual voltage 110V/230V AC capability and 32 tones – including all of the major international standards – make the product universally acceptable.

Units are available in either red or white as standard. Beacon heads can be specified in red, amber, clear, green and blue variants.

For more information please visit Klaxon's website at www.klaxonsignals.com

A Beam Detector for all Installations

WHEN IT comes to optical beam smoke detectors no other company has the experience, or the product range, of Fire Fighting Enterprises Ltd. With well over 600,000 beams installed, including in some of the World's most prestigious buildings, it is clear that the FireRay series of projected beam detectors is the model of choice for both installers and specifiers.

The model range comprises:

The FireRay 2000 end-to-end beam detector, a well-established product noted for its ruggedness, small detector head size and low level control. The small size of the transmitter and receiver mean that it is ideally suited to projects where a low visual impact is required, such as buildings of historical importance. The FireRay 2000 has CPD, EN54 and UL

certification plus others. A typical installation is Hong Kong International Airport where the beams do not interfere with the stunning Norman Foster design.

The FireRay 50/100 reflective beam detectors were amongst the first purpose built reflective products. The big advantage with this product is that both the transmitter and receiver are in the same discrete unit, which reduces the amount of cabling required thus saving time and significantly reduces installation costs. The FireRay 50/100 reflective has CPD, EN54 and UL certification plus others. This beam has been used in many prestigious locations including the British Museum and the Foreign Office in London.

The **FireRay 2000 Eexd** is the only ATEX 94/9/EC certified beam detector available.

Its flameproof construction and robust housing make it particularly suitable for use in hazardous locations where other types of smoke detection would be unsuitable. Typical applications are oil refineries, petrochemical plants and warehouses for the storage of flammable liquids. These beams have been successfully used in ordnance bays in the Falkland Islands and in some marine applications.

The new flagship model of the range is the innovative **FireRay 5000 Auto-Aligning Infra-Red Optical Beam Smoke Detector**. This is a completely new design that incorporates pioneering technology that addresses the needs of both user and installer. Key features include: Easifit First

Fix system; LASER assisted alignment, *AutOptimise* automatic beam alignment and a 2-wire interface from the detector to the controller. This pioneering product is currently going through the approval process for CPD, EN54 and UL and is protected by British Patent Application 2426323 and by International Patent Application PCT/GB2006/1799 pending.

Further details can be found on our website: www.ffeuk.com

FETA and BFPSA members vote 'Yes' to merger

AT A meeting of the British Fire Protection Systems Association (BFPSA) and the Fire Extinguishing Trades Association (FETA), the respective associations' members have voted overwhelmingly to merge the two organisations.

Following detailed work by a joint task group, the proposal to merge into a single larger Trade Association was put to members at Grosvenor House, London on 8 November, 2006. The voting members present were unanimous in accepting the proposal and thus FETA and BFPSA will form a new trade association – The Fire Industry Association (FIA), with effect from 1st April, 2007.

Brian Gibbons, Chairman of FETA and Dr Peter Moore, Chairman of BFPSA co-chaired the meeting and were delighted that the memberships had recognised the significant benefits of merging what are two of the most widely respected and most active trade associations operating within the fire protection industry. Mr Gibbons commented – "FETA has been in existence since 1916 and has become a name synonymous with quality in the fire extinguishing side of the business. However, times move on and we have seen the advantages of presenting a unified voice for the fire industry, particularly in terms of our representation to government. We see this merger with the BFPSA, with whom we have already been working increasingly closely for a number of years, as the means to present that unified voice, while at the same time increasing the benefits to our members and retaining the FETA 'brand' which has become so well respected by our customers."

Dr Moore added – "We are delighted that both the BFPSA and the FETA members have voted so positively to the merger proposals. The objectives of the two associations have become closer and more sharply defined in recent years, notably the promotion of third party certification as the most effective means of demonstrating competency in the new era of fire safety legislation. I'd like to pay tribute to Terry Glossop, the Chairman of the joint task group, for his considerable efforts in getting us to a point of decision. The newly formed Fire Industry Association will build on the solid foundation of BFPSA & FETA, and will be well positioned to take us forward to new levels of representation. Our Industry can look forward to a new organisation which will deliver the key benefits of enhanced services to members, improved internal efficiencies and a stronger, more encompassing voice with all stakeholder groups."

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bst-firestop.com

The multi-talent high-tec supplier in preventive fire protection and sealing

You may have read about bst-firestop.com in the technical press and magazines. The shipbuilding industry uses the multi cable transits of bst, who are located in Vienna, Austria.

They are said to be one of the global technology leaders by the world's largest shipyard. They use these sophisticated products for their premium projects, i.e. LNG (Liquid Natural Gas) carriers, VLCCs (Very Large Container Carriers), offshore drilling and production platforms etc., but also the Korean Navy prefers bst products for their new developments like ACV (Air Cushion Vehicle), PKX (Patrol Killer Experimental) or LPX (Landing Platform Experimental). The so called Quick-Fix modular multi cable transit in TCM (Tolerance Cable Module) technology is also welcome in other industries like mobile telecom substations, in airport towers or cable collectors of large railway marshalling yards and mass transport systems, airports, petrochemical industries, natural gas compressor and underground storage stations, hospitals; the range of use is indeed very wide. It not only protects against fire, it also seals against gas, water and explosions up to a medium/high pressure level.

bst-firestop.com is a company not only focussed on one product or system; bst offers a wide range of different products, each individually developed and adapted for individual problem solutions: a hotel, an art museum or a symphony hall needs different solutions than a road tunnel, and within a symphony hall there are again different demands on sealing and protection devices. And it is a different way to go if you renovate an existing building and adapt it according to highest protection standards, or if you build a completely new hall and have to fulfill achitectural dreams as well as safety engineers advice in a visible or non-visible high-tec design. Installers prefer bst-firestop.com since they supply one-stop solutions.

Extraordinarily designed Symphony hall of Porto, Portugal: bst inside.

Another field is the sealing of large and integrated production and process systems like waste water plants, gas pipeline systems, embankment and hydro power plant dams (which can have high levels of 100 meters and more in the Austrian alpine electricity plants), where plastic or steel piping is crossing concrete or steel constructions. Also here the Link-Seal, GPD or other special solutions help the engineer to solve problems.

bst offers a wide range of different products, each individually developed and adapted for individual problem solutions.

A very new product is the bst Quick Spy, a highly sophisticated linear sensor cable detection system. The 500 meter long sensor cable contains up to 250 addressable sensors and up to 4 cable units can be combined to one Stand Alone Signal Processor, up to 25 sensor clusters can be defined. The working temperature range of the sensors is between –40 thru +80°C, other sensors can be integrated by a Generic Remote Interface. The data can be transferred to a control station also by radio. The complete field of application is not yet discovered for this new system. It is already in use inside road tunnels. The marine industry is highly interested, necessary approvals are under way at the moment. bst's story of development will not end yet. IFP

World's largest container line trusts in bst-Quick Fix.

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Website: www.bst-firestop.com

Angus Fire Selected as Exclusive Foam Provider

ANGUS FIRE announced that it has won a major contract to supply SembCorp Utilities UK with Tridol ATF 1x3 fire fighting foam. Angus Fire is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).

Based on Teesside in the North of England, SembCorp provides emergency response services to one of the highest concentrations of chemical plants and refineries in Europe. With access to the largest industrial foam stocks in the UK, it responds quickly and effectively to fires involving a range of different flammable liquids.

"This new partnership gives SembCorp access not only to the latest foam technology, but also to strong technical support. The logistics expertise of the Angus emergency service, which proved so effective at Buncefield, will also help us to source additional foam stocks when we need them urgently," said Greg Richardson, SembCorp's Protection Technical Manager.

Previously, SembCorp used a foam product from a different manufacturer. It had considerable post-fire clean-up costs due to an environmentally harmful ingredient called PFOS and has since been withdrawn from the market.

Angus Fire's Tridol ATF is a new generation PFOS-free foam that provides high fire fighting performance and is a 1x3 grade, which is more efficient to handle at incidents than 3x6 grade foams.

"SembCorp is leading the way for emergency response organisations that still stock PFOS-based foam. By acting in advance of possible changes in environmental legislation that may prohibit its use at emergencies they are positioning themselves well for the future," said Martin Hough, Sales Manager for Angus Fire.

The new foam will be supplied by J&RA Hawkes & Sons, Angus Fire's authorised distributor in the North of England. Hawkes is also collecting the old stock and arranging for it to be disposed of by the required method of high temperature incineration, and arranging for the new foam stocks to be tested regularly to ensure that they remain uncontaminated and in good working condition.

Angus Fire is the largest foam manufacturer in the world, producing a complete range of environmentally responsible foams at its factory in Bentham, North Yorkshire. It also manufactures fire hose and fire equipment at Bentham, and provides product sales and customer support from Thame, near Oxford. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers throughout the world.

Left to Right: Andy Hawkes (J&RA Hawkes & Sons), Greg Richardson (Protection Technical Manager, SembCorp), Martin Hough (Sales Manager, Angus Fire).

UTC Fire & Security, headquartered in Connecticut, USA, is a business unit of United Technologies Corp., which provides high technology products and services to the building and aerospace industries worldwide.

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Unifire AB and Rosenbauer International AG announced as partners

Tokyo Bosai Setsubi Co., Ltd. (TBS) of Japan announces that it has selected Unifire AB of Sweden and Rosenbauer International AG of Austria as partners for its innovative automatic fire detection and extinguishing CAFS system. The system, created by TBS, combines a fire detection system, a redundant central computer command system, Unifire stainless steel Force series remote-controlled water/foam monitors, thermal (and optional optical) cameras mounted on each Force monitor, and the Rosenbauer Flash CAFS system for added fire extinguishing effectiveness.

In the event a fire is detected by the fire detection system, a signal is sent to the systems controlling computer indicating the fires general location. The closest monitor (or monitors) then immediately begins scanning as the thermal imaging cameras locate and triangulate the exact position of the fire on an x, y, z coordinate system. The coordinates of the fire are fed back to the controlling computer, which then calculates the best trajectory and accordingly aims the monitors to cover the fire. The entirely mechanical Rosenbauer Flash CAFS system then begins discharging a compressed air foam solution through the monitors, directly onto the fire, without any external power supply. The monitor is preprogrammed to oscillate in a pattern most effective to cover the entire fire, and the nozzle is also programmed to effectively vary its spray pattern seamlessly between jet and spray. The parameters of the monitors oscillation and the nozzles spray pattern can be programmed to vary according to the size and location of the fire, and are fully adjustable to meet the customers particular needs.

The system can rapidly extinguish fires and limits the spray to the specific area where the fire breaks out. It can deploy fully automatically or, if desired, either semi-automatically or manually with the operators prior approval and/or intervention at any time. The system is designed to endure very harsh environments, including by use of the Unifire stainless steel 316 monitors, and it can be deployed in numerous environments such as tunnels, underground structures, refuse pits, oil tanks, parking garages, on the interior and exterior of buildings and warehouses, airport arrival halls, and in aircraft hangars, to name just a few.

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WPI Fire Protection Engineering Excellence

Quality Education with the Convenience of Online

WPI is home to the world's leading educational program in fire protection engineering – which incorporates elements of civil, structural, electrical, and chemical engineering to make structures, vehicles, clothing, and people safer from fire. In addition to offering the nation's first master's degree program, the university was the first to provide a graduate-level program in fire protection engineering via distance learning in 1993, and it grants the world's only formal Ph.D. program in the field. WPI has conferred more than 350 masters and doctoral degrees in fire protection engineering, with students hailing from more than 30 countries.

All distance learning fire protection engineering programs are offered through the *Department of Fire Protection Engineering* which focuses on teaching current theories and practices, and conducts research to uncover new knowledge about fire behavior and fire protection methods. Bringing together talents from many disciplines with a common focus on fire safety issues, this leading-edge program takes a unique approach to fire protection engineering research and practice.

$850,000 Grant Awarded on Fire Safety and Deployment of Resources

Service demands and public expectations placed upon local fire departments continue to rise as threats to communities from both natural and manmade disasters including terrorism reach new highs. A team of industry experts have received a $850,000 grant to conduct a 3 year study on this significant concern. Kathy A. Notarianni, Ph.D., P.E., WPI Fire Protection Engineering department head, Jason D. Averill, National Institute of Standards and Technology, and Lori-Moore-Merrell, MPH, International Association of Fire Fighters are conducting an in-depth study on this resource shortage. Over the past three decades fire department response has expanded to include emergency medical services, terrorism response, hazardous materials response, natural disasters and other community risks. The expansion of responsibility has not always been matched with an adequate deployment of resources. Studies on firefighter safety and resources will be conducted to enable fire departments to be adequately prepared.

"Fire and Materials" Graduate Course Developed

Materials and their use has changed dramatically over the years. Providing for safe application of these materials is essential. WPI Professor Nicholas Dembsey, *Fire Committee Chair – American Composites Manufactures Association,* has a keen interest in materials reaction to fire. Through many years of research work in conjunction with FM Global, as well as Ph.D. thesis work, Nick is highly attuned to the challenges of manufacturing materials that will have the necessary fire characteristics to be safe as well as the needed performance to be used in buildings, airplanes, trains and boats. The culmination of this research prompted Nick to develop a WPI graduate course entitled "Fire and Materials". This course focuses on properly characterizing fire behavior of combustible materials via effective properties. Methodologies ranging from fire dynamics based indexing to varying complexity pyrolysis models are studied throughout the course.

Tyco and WPI Joint Research Project

Joint research projects between industry leaders and academia are the hallmark of prestigious universities. TYCO Fire & Building Products has awarded a grant in fire suppression research to the Department of Fire Protection Engineering (FPE) at Worcester Polytechnic Institute (WPI). The research project will explore the effect of residential fire sprinklers on tenability limits during a fire. It will also evaluate current standardized test requirements to determine whether approvals tests use a fuel package representative of that expected in the preponderance of residential fires. IFP

For more information contact:
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www.online.wpi.edu

Where vision meets function:

Fire safety building design with glass

Modern glass design requires special consideration of the needs of fire safety. Advanced high performance fire-resistant glass is now available and used extensively but there is nevertheless a tendency to take glass for granted because of its popularity and widespread use. For most applications this easy familiarity is of little consequence but fire has the potential to spring unpleasant surprises. Complacency regarding glass design and specification could be disastrous if care is no taken to have the right glass with the most appropriate performance in critical locations. An appreciation of glass behaviour in fire is therefore important for today's designer. *Mike Wood* of Pilkington provides an overview from his experience of some key considerations for risk-based functional fire safety design, drawing from the latest testing of glass behaviour under fire conditions.

By Mike Wood

Global Consultant,
Fire Protection,
Pilkington Group
Limited

Why use fire-resistant glass?

The essential benefit of fire-resistant glass is that it allows full scope to be given to glass constructions – with all the unique advantages that glass offers – without having to compromise on performance specification, creativity or innovation. For reasons of fire safety, stipulations of building regulations, authorities, insurers or clients can force constraints on design. With fire-resistant glass, tailor-made solutions can be created to fit the building, its purpose, and the diverse demands of building occupiers and owners, whilst providing a distinctive and eye catching design that adds to the reputation of the designer and the owner alike. Without fire-resistant glass, the designer's options in using glass to its full capability are severely restricted.

Fire safety design strategy

A compartmentation and fire separation strategy provides the backdrop for the use of fire-resistant glass, to isolate and contain fire for easier and rapid suppression or extinguishment. Fire-resistant

glass is therefore particularly used in partitions or doors providing protected corridors and transit points for quick and safe evacuation or rapid access to the seat of the fire by fire and rescue personnel.

One of the core design benefits of glass is to channel natural light captured by the glass facade right into the heart of the building to enhance the internal space and ensure maximum utilization of floor area. Glass exteriors therefore call for extensive application of glass throughout. This leads to the use of fire-resistant glass in walls, roofs and even floors to ensure that the necessary compartmentation is achieved without losing the key quality of openness and vision created by glass design.

The feeling of openness created by glass constructions also has an advantage in advancing fire safety: it helps to reduce panic and encourage orderly evacuation by allowing occupants to be aware of what is going on around them so that they feel less isolated than would be the case in dark, enclosed structures.

The designer's choice

The designer is faced by essentially three levels of choice where fire safety in glass constructions is concerned.

- Standard glass products such as tempered (or toughened) glass may be used in combination with sprinklers. This is the highest risk option since tempered glass and water do not necessarily combine well under fire conditions. The original design, glazing condition and history, and fire circumstances need to be optimum for effectively reliable fire protection in case of fire. There is little margin of safety. And in the event of fire, chance may substantially determine the outcome.
- Integrity fire-resistant glass can be used to hold back the fire for a period, with a risk that levels of heat on the protected side are too high for both people and materials. Consideration of transmitted heat levels causes the size of integrity glass to be limited. Applications may also be quite specific. The level of protection may only be sufficient for the purpose of rapid evacuation of the building in short time, on the assumption that the alarm is given and acted upon relatively promptly and that the fire and rescue service receive the emergency call in good time for rapid response.
- The highest level of protection and the highest degree of confidence in effective fire protection can be obtained by the use of a fire-resistant glass that provides reliable insulation performance in combination with integrity (e.g. Pilkington Pyrostop). Large areas and extensive use of such a fire-resistant glass can be incorporated in the design, in a variety of applications, for the purposes of escape, access and prolonged protection against high fire intensity and hours of exposure.

Insulation is the most reliable choice and the one that offers maximum peace of mind. If the objective is to have a substantial measure of confidence against the occurrence of fire, given the fundamental uncertainty of fire events, during the working life of the building then insulation performance should be the preferred priority choice.

Limitations of standard glass in fire

Although non-combustible, the natural fire resistance of standard soda-lime-silica (i.e. "window") glass is strictly limited. Reliance on standard glass products for significant protection of life and property against fire is *not* an effective, realistic option.

Cracking of standard annealed glass occurs almost immediately on exposure to even relatively light fire conditions, typically followed by fall out within about 5 to 12 minutes. A rise of as little as 80°C may be sufficient to initiate cracking. The exact cracking pattern, and hence the extent of

fall out, is essentially different from case to case. Predicting when and to what extent glass falls out of the frame is therefore inherently uncertain and the course of events in each case is highly unpredictable. Double glazing is equally as unpredictable and may not be significantly better than single glass panes.

Characteristics of tempered safety glass

Tempered (or thermally toughened) glass produced for impact safety is about five times stronger than standard annealed glass. It is designed for use under physical impact when it either does not break or breaks safely into a pile of small pieces without sharp edges. Under fire conditions this designed mode of failure is catastrophic, totally destroying any glass barrier against fire. Tempered glass for impact safety is not primarily designed for resistance against fire. Repeat furnace tests and strength measurements show that the probability of failure can be high, depending on glass condition and circumstances. The probability function in each case is substantially determined by features of the particular framed glass plate under consideration and by the impossibility of knowing precisely the stress field generated by the range of possible fire conditions. The failure characteristic also means that the onset of failure is sudden, without warning and essentially unpredictable, in each case with a finite probability that cannot be generically defined.

Even modified toughened glass for fire resistance has to be used and produced under carefully controlled conditions, and precisely specified framing conditions, to minimise the risk and probability of catastrophic failure. Under natural fire conditions, the probability of failure of commercial framed product may not be entirely discounted. Also, if the glass should survive the initial shock then the heat exposure in a fire may subsequently cause the thermal condition of the glass to change as stress relaxation takes place, particularly under longer exposures.

Tempered glass and sprinklers

Designers who depend on tempered glass in combination with sprinklers should be aware that there is a risk of catastrophic failure of the tempered glass under natural fire conditions. This risk is particularly heightened if uneven heating or uneven shock cooling of the glass is a possibility. In fire, the tempered glass is vulnerable to local heating, inadequate water flow, failure of the water and delayed sprinkler operation. In practical glazed situations, fittings, furnishings and transoms, in particular, may cast shadows across the glass preventing even and continuous water coverage.

Because of the vulnerability of tempered glass to thermal shock, a sprinkler-tempered glass system may not provide a sufficient assurance of performance reliability which is so necessary under fire conditions.

Safety and security laminates

Glass laminated with a plastic interlayer designed for impact and security properties also has limited fire resistance behaviour. In this context "safety" refers to impact and not fire safety. The interlayer is organic and has high plasticiser content. Under fire conditions the plastic interlayer deteriorates quite quickly by turning to liquid, smoking and then igniting. In fire tests, such laminates fail in 5 to 8 minutes. Failure is typically fast and catastrophic, caused by glass cracking and flaming of the interlayer.

Integrity performance

Fire resistance integrity is the ability of the glass to act as a resilient barrier against flames. It is evaluated under test conditions for standard time periods against criteria that require no sustained flaming on the non-fire side (i.e. for more than 10 seconds), no holes or cracks of defined dimensions, nor ignition of a cotton pad held against any potential hole or crack.

The basic integrity performance contains no limitations of the heat levels on the non-fire side – and transmitted heat can therefore rise to high levels which in only a few seconds can create conditions that are both intolerable for humans and present a possibility of the charring of wood close to the glazing and ignition of synthetic materials. Basic integrity fire-resistant glass in a developed post flashover fire is therefore only realistically sufficient for rapid escape in a matter of seconds, where the conditions are not over crowded and where the escapees can move relatively easily in streamlined flow.

Enhanced integrity class

The European classification standard EN 13501-2: 2003 includes a new integrity category with a measure of performance in attenuating radiant heat levels on the non-fire side. This is the EW category (introduced essentially to ensure that the regulations of one member country of the community can be accommodated within the new European document system).

The qualifying criterion for the EW class is a maximum radiant heat level measured in a standard furnace test at a distance of 1 metre of 15kW/sqm or less. The area of the glass is not specified, however, and there is no differentiation within the classification scheme for glass types with major differences in radiant heat transmission (as is possible from the range of available commercial products). This means, for example, that one product with a measured value of, say, 3kW/sqm and another with 12kW/sqm can be included in the same category – whereas the differences in

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radiant heat levels, and the effects in practice, will be of tremendous significance. As a rule of thumb, the sun's maximum intensity at the earth's surface is about 1kW/sqm. With this parameter in mind, it is immediately evident that the EW classification is capable of including quite a range of radiant heat intensities, some of which will give only a few seconds, in effect, for safe escape. Data from both DIN and NFPA standards show tolerance times of only 4 to 6 seconds before there is a risk of unbearable burns for an exposure of 10kW/sqm, for example. In contrast, a level of 3kW/sqm gives more than 17 seconds.

Benefits of insulation

Insulation is defined by performance in a standard fire test that achieves an average surface temperature rise on the non-fire side no greater than 140°C, with no point being greater than 180°C. This provides a clear and unambiguous determination of performance, limiting heat by all transfer mechanisms. Radiant heat levels on the non-fire side of insulation glass panels at 1 metre distance are typically less than 1kW/sqm at the standard test times defined in the test standards (e.g. 30 minutes). The UK's Building Research Establishment (BRE) fire safety engineering guide, for example, advises a safety limit for human tenability of 2.5kW/sqm. Such levels are readily achieved by a product showing insulation performance. Only certain enhanced integrity, i.e. EW, glass types are capable of limiting heat below 2.5kW/sqm for a significant time of several minutes.

Applications of fire-resistant glass

The early, and still common, applications of fire-resistant glass were in fire-resistant vision panels in fire doors and overhead glazing. The introduction of advanced insulation with integrity fire-resistant glass technology (for example the special laminated intumescent interlayer technology used in Pilkington Pyrodur and Pilkington Pyrostop) has provided the springboard for a tremendous expansion in the use of fire-resistant glass. Today a full range of fire-resistant applications can be seen, from full size glass doors to transparent full size glass walls, floor and roof constructions, corridor partitions, lobbies, stairwells, and atria. High performance fire-resistant glass facades can also be used because of the recognised risk of fire movement either on the same level or from floor to floor by break out and break in through standard glazed facades. The latest developments even allow design with fully loaded integral fire-resistant glass floor constructions.

Modern high performance fire-resistant glazed systems have been specifically designed to combine with the full range of other modern architectural glasses. They readily blend in visually with other glass types and can be used in vertical, horizontal or inclined applications. There is therefore tremendous scope in modern glass building design to exploit all the benefits of glass with judicious specification and application of fire-resistant glass. This effectively removes constraints that may apply though the stringent demands of fire safety and opens up tremendous opportunities for flexible glass building design. IFP

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Pic courtesy of Angus Fire

The Evolution of the Foam Top Pourer

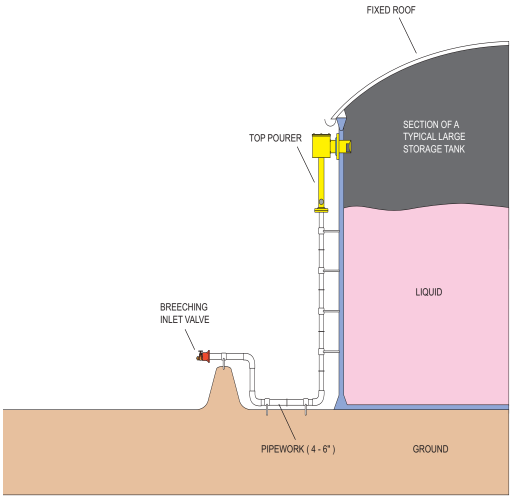
By Michael Mills

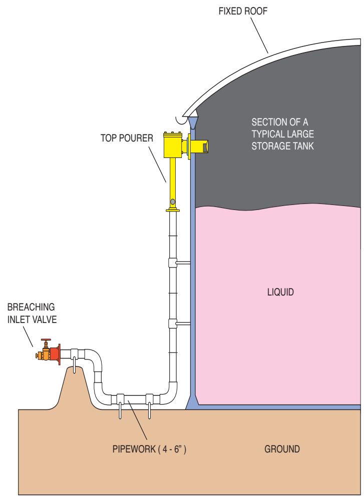
Angus Fire

As flammable liquid storage tank fires continue to make spectacular headlines around the world, the latest foam top pourer technology is enabling tank farm operators to "unspectacularly" nip them in the bud!

Installed on the side walls of fixed-roof (cone) and covered (internal) floating roof storage tanks, Top Pourer Sets (TPS) or Foam Chambers are designed to cover flammable hydrocarbon or water miscible liquids with low expansion foam for fire extinguishment or vapour suppression. They have the advantage over ground-based monitors of directing all their foam directly onto the flammable liquid surface regardless of weather conditions.

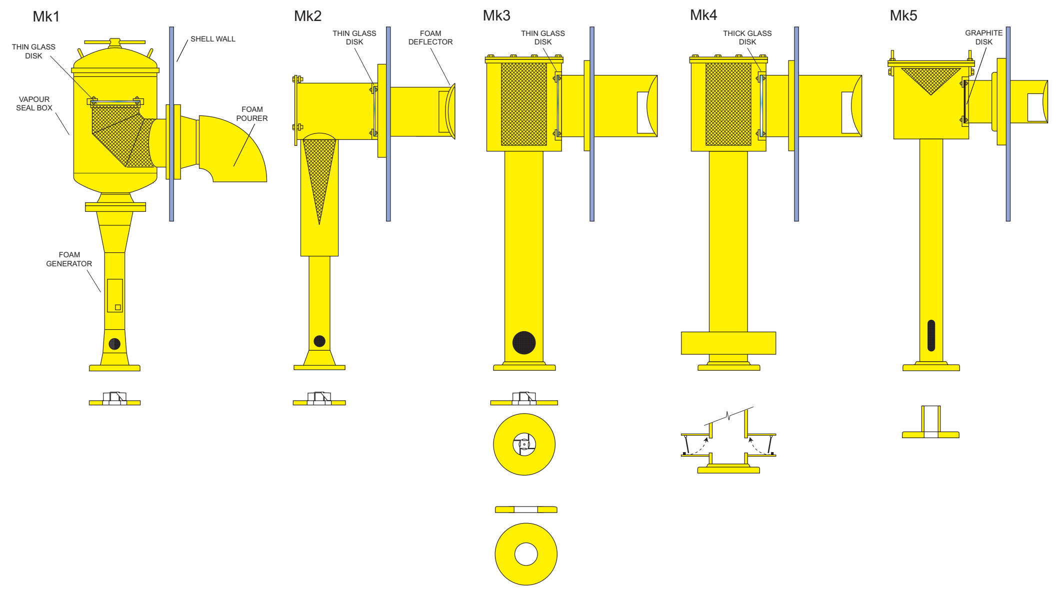
The first TPS was developed over thirty years ago, comprising a foam generator, vapour seal box





Angus Fire TPS

Angus Fire TPS



and foam pourer. The foam generator made foam by introducing air into a foam solution stream that was delivered to the TPS in a variety of ways. Foam solution piping coupled to the unit was linked to a fixed foam proportioning system, or terminated a safe distance from the tank where it was linked to mobile foam proportioning equipment. The inlet of the TPS was fitted with a venturi jet designed to draw air into the foam solution stream through a series of holes located around the foam generator. Obstruction of the air inlet holes by nesting birds and insects was prevented on some models by a stainless steel screen.

The aerated foam then passed into a vapour seal box, which improved the quality of the foam and reduced its velocity prior to discharge on to the product surface. It was fitted with a frangible glass bursting disc or vapour seal located across the inlet to the discharge pipe. This prevented the escape of product vapours to the atmosphere. The

Pic courtesy of Angus Fire

flow of expanded foam ruptured the vapour seal at a pre-determined pressure, allowing the foam to enter the tank through a foam pourer.

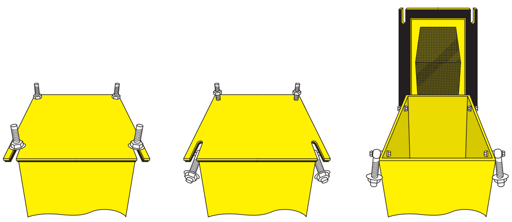
Gently does it

The next generation of TPS was a less bulky and more cost-efficient design. It achieved this by adding to the vapour seal box a mechanical agitation mesh device or "improver" that was specially designed to produce top quality foam by optimising its expansion and drainage characteristics.

An even more important development was a new method of applying the foam on to the fuel surface. As the foam exited the pourer, it impacted a special deflector plate fitted to the outlet which directed the flow back against the inner tank shell wall in a butterfly-shaped dispersion pattern. This made the foam run down the tank shell and flow gently on to the fuel surface, reducing the amount of foam submergence and fuel pick-up. This is an important consideration, especially with water miscible fuels. It also dispersed the foam to each side of the TPS for faster and more complete coverage. Applying the foam gently in this way is classified as Type II application by NFPA and Underwriters Laboratories as opposed to the forceful Type III application of ground-based foam monitors. It increases the effectiveness of the foam blanket, resulting in more efficient operation and superior extinguishing performance.

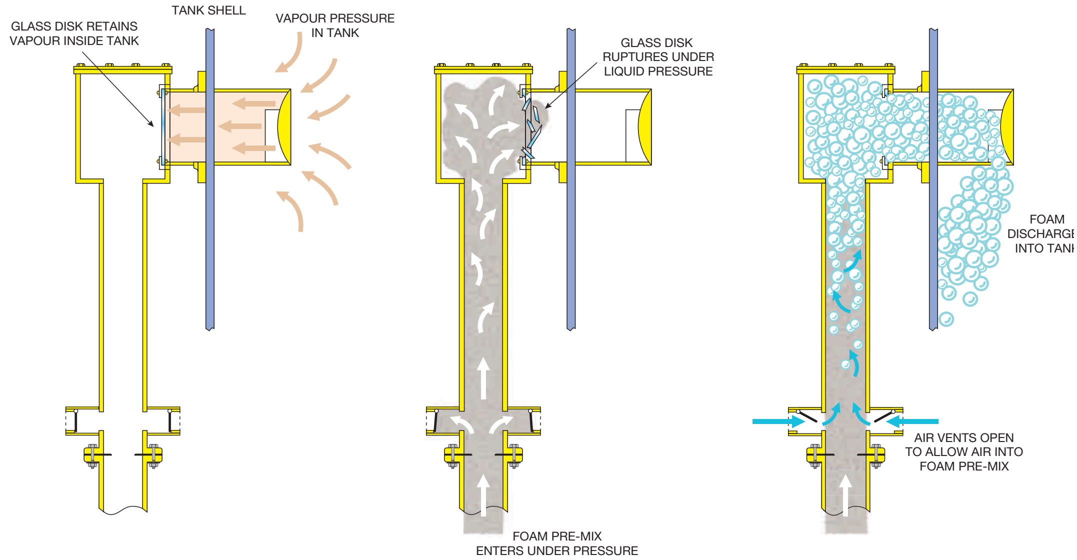
Maintenance matters

An early innovation in TPS design was warmly welcomed by safety maintenance engineers. A test cover was introduced at the rear of the unit, which for the first time enabled the unit to be tested without foam entering the storage tank. Nowadays a more easily accessible cover on top of the unit combined with an exclusive location of



Angus Fire TPS

Angus Fire TPS



bursting disc provides even quicker and easier access. The top cover also facilitates regular inspection and periodic replacement of the bursting disc. The latest models offer top plate access with only four bolts and a captive cover plate. The four bolts swing away to allow the lid to pivot, giving access without the risk of any components being lost or falling from the unit and saving valuable time during maintenance inspections.

Fixing kits

Special TPS fixing kits are available that make installation much easier. They enable a TPS to be fitted safely and quickly from outside the tank, completely eliminating the need for hazardous, time-consuming and expensive welding work. They typically consist of a studded adaptor flange that is bolted and sealed to the tank before the TPS unit is mounted on to the protruding studs and secured in position. The use of fixing kits minimises the installation time for each unit, and also forms an even tighter seal against tank curvature on small diameter tanks.

The dispersal tube length can be increased to allow the deflector plate to be in the optimum position inside the tank.

The latest TPS models also offer flexible mounting dimensions. The length of the foam dispersal tube projecting into the tank interior can be specified by the system designer to accommodate site specific mounting arrangements. The standard or minimum length of the foam dispersal tube is designed for pourers mounted directly on to the tank wall and positions the deflector plate at the optimum position inside the tank to spread the foam evenly around the interior. Where pourers have to be mounted on flanges away from the tank outer wall the dispersal tube length can be increased to allow the deflector plate to be in the optimum position inside the tank.

Pressurised tanks

Most TPS units today are designed for tanks where the internal pressures do not exceed 0.17 bar

(2.5 psi). Where the tank is pressurised, for example with a nitrogen inerted blanket, or where high internal tank pressures up to 0.34 bar (5 psi) may be experienced during normal operation, a special type of TPS is recommended. It features a thick high pressure glass bursting disc and a unique valve arrangement. One-way flaps over the air intakes ensure the full pressure of the foam solution entering the unit is applied to the bursting disc to ensure it ruptures during an emergency, while allowing for variations in internal tank pressure during normal operation.

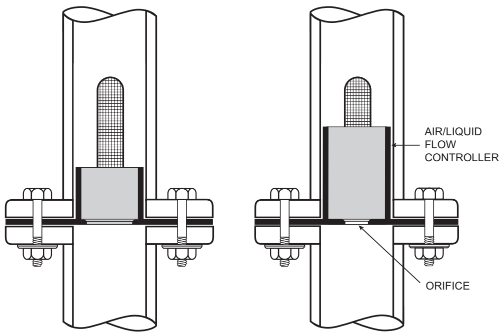
Precision control

The latest TPS models feature bursting discs fabricated from impregnated graphite instead of glass for precision control of the bursting pressure. Graphite ensures that the disc will burst when subjected to the pressure of foam entering the top chamber but will not burst or leak during normal tank operations such as filling and discharging. The use of graphite enables the bursting pressure to be held within tolerances of +/–0.05 bar (+/–0.75 psi). This is almost four times better than achieved with glass discs.

In addition, improvements to the design of the disc holder and the use of an "O" ring seal allow the graphite disc to be replaced quickly and easily without changing the holder. The use of an "O" ring also mean that no adhesive (which may be susceptible to attack by the tank contents) is required to hold the disc in the holder. Graphite is highly inert and so temperature-resistant and compatible with a wide range of corrosive chemicals.

Top hats

To provide precise control over the ratio of foam and air, the latest TPS designs are fitted with a special top hat orifice plate assembly. Each orifice is specifically designed to allow the correct amount of foam solution into the foam-making tube after taking into account the supply pressure at the inlet flange, the foam type and concentration. In addition, a stainless steel sleeve above the orifice blocks off part of the air inlet duct ensuring the amount of air drawn into the foam generator is correct for the quantity of foam solution supplied. The unique combination of orifice and sleeve



Angus Fire TPS

Pic courtesy of Angus Fire

Pic courtesy of Angus Fire

ensure that optimum foam expansion is achieved at every pourer and that optimum use is made of the foam.

Choice of foam

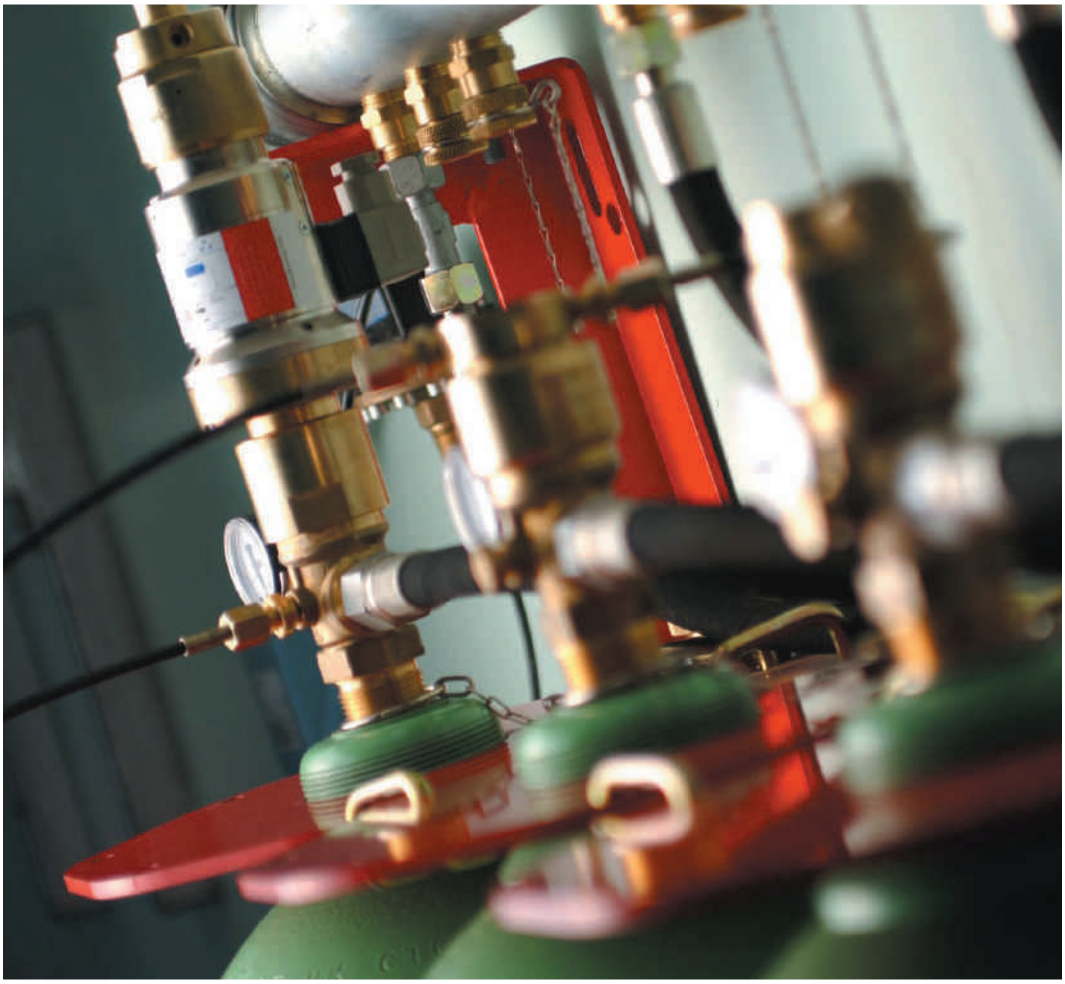
TPS units are compatible with all the main types of foam concentrate. While AFFF and FFFP are used in some instances, independent tests have shown FluoroProtein, AR-AFFF and AR-FFFP to provide the best performance. The important point is to make sure your foam comes with a LASTFIRE certificate. Developed by the world's leading oil companies, the LASTFIRE foam test is specifically designed to simulate large storage tank fires and subject foams to the most rigorous scrutiny. Some LASTFIRE certificated foams, such as Angus Tankmaster, have been specially developed to extinguish large storage tank fires involving hydrocarbons. Its FluoroProtein-based bubble structure provides exceptional resistance to heat, enabling it to pass through flames, impact on hot fuel and move over the burning liquid surfaces. Its bubble walls are tough enough to seal against even the hottest tank shells, and even under a torrent of cooling water its foam blanket remains in tact. Similarly, Alcohol Resistant foams like Angus Tridol ATF are ideal where polar solvent chemicals are stored.

TPS units are compatible with all the main types of foam concentrate.

Chamber of horrors

The importance of incorporating TPS units into a properly engineered foam system cannot be overstated. Systems should be designed in accordance with the NFPA 11 Standard using TPS models Listed by Underwriters Laboratories. TPS units are available in a broad range of sizes to suit most requirements. Typical capacities range from 75 to 3,300 litres/minute at inlet pressures between 2.5 and 10 bar. Each unit should be accurately factory-calibrated to provide specified flow rates at the required system operating pressures. This will ensure effective and cost-efficient use of foam concentrate and water resources when installed on new tanks or retrofitted to existing tanks during refurbishment. If TPS units are constructed from the latest heat-resistant materials and engineered to the highest standards, then they can be relied on to tough it out under even the most gruelling and adverse fire conditions. What should be avoided is a "chamber of horrors" that is difficult to install and maintain, does not make efficient use of water and foam resources and uses vapour seals that burst prematurely during normal tank operations. IFP

Michael Mills is Product Manager at Angus Fire responsible for the global marketing of the company's wide range of engineered products including foam-making equipment. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers around the world and is headquartered at Connecticut, USA.



Keep it clean

No longer is concern regarding global warming the preserve of environmentalists and "green" politicians; today its impact is coming home to all of us. As a consequence, even more attention is being paid to the environmental credentials of suppression agents. Here, John Allen, EMEA Marketing Director of Tyco Fire & Security's Fire Suppression Group, looks at the contribution being made by Tyco's latest gaseous systems.

By John Allen

EMEA Marketing Director of Tyco Fire & Security's Fire Suppression Group

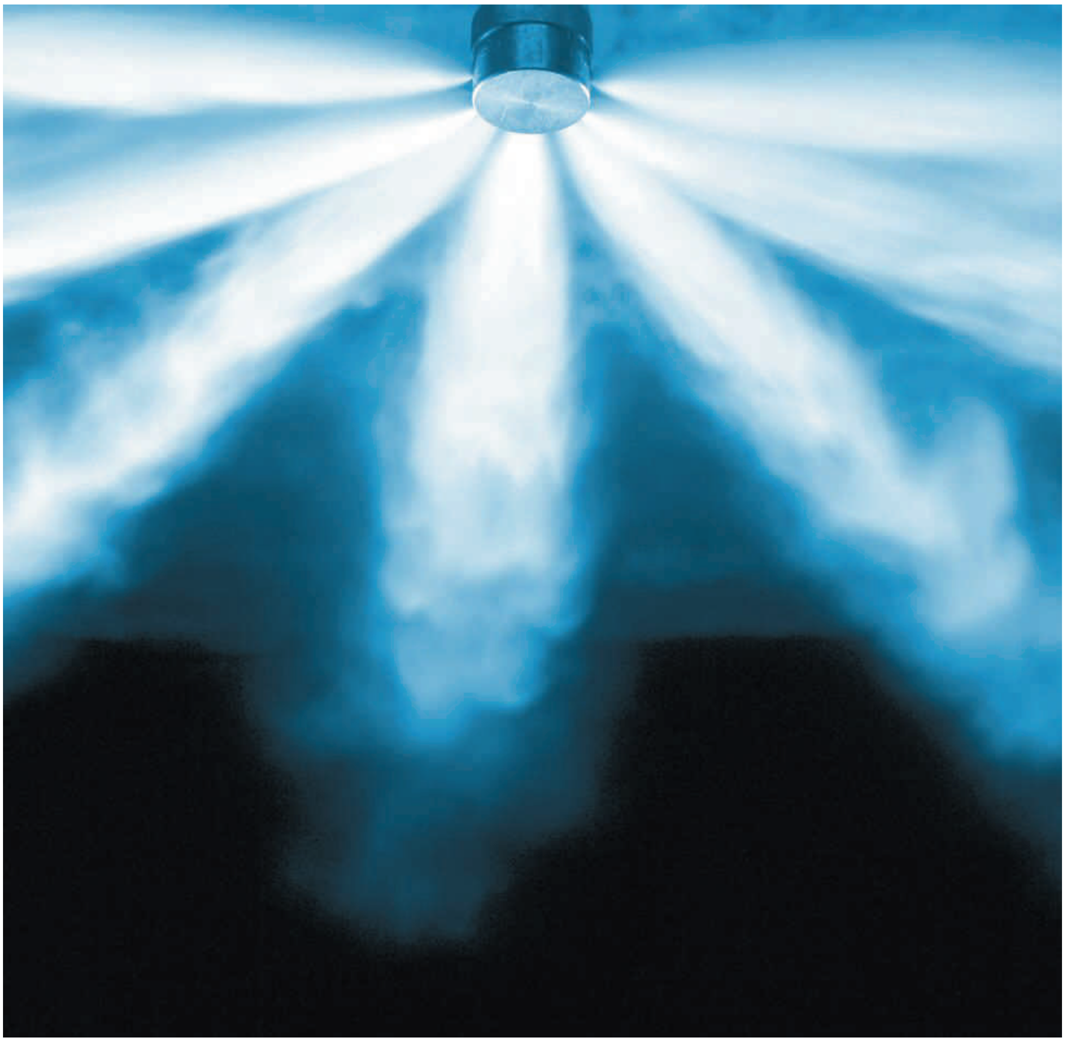
The Kyoto Protocol on climate change has, as its goal, the reduction of greenhouse gas emissions, preventing dangerous anthropogenic – man-made – interference with the climate system. It is targeting a basket of six gases: carbon dioxide, methane and nitrous oxide, along with in three long-lived industrial gases: hydrofluorocarbons – more frequently known as HFCs – perfluorocarbons and sulphur hexafluoride.

Carbon dioxide [CO_2] has, for many years, been a popular and successful fire suppression agent, yet estimates suggest that, as a fossil fuel, it accounts for 82 per cent of the world's greenhouse gas emissions. Additionally, carbon dioxide systems, when used at design concentration, are lethal to room or enclosure occupants, so are only appropriate to unoccupied areas. HFCs certainly assisted the Halon phase-out programme and helped in the transition away from ozone depleting substances, but they have significant global warming potential. So neither can lay claim to being clean, as the Kyoto Protocol bears out.

So, to meet both the market's need for a genuinely sustainable, environmentally acceptable and long-term suppressant, Tyco has, over the past couple of years, introduced two new gaseous systems – i3 inert gas and Sapphire.

i3 – the inert gas option

Inert gas suppression systems were the industry's immediate answer to the global warming challenge, with precisely the environmental credentials that the market was seeking: zero ozone depletion potential, zero atmospheric lifetime, and zero global warming potential. They represented the market's first truly sustainable "clean" fire suppression technology. Inert gases are non-toxic, they will not harm sensitive electronic equipment,



art treasures or documents, and are safe to use in enclosed areas where people may be working.

These gases, of which Ansul's Inergen is surely among the most respected names globally, are either a non-conductive and non-corrosive blend of naturally occurring gases – such as a combination of Nitrogen and Argon – or, less frequently, a single naturally occurring gas. They work by lowering the oxygen content of the protected area to a point that will not support combustion, but is sufficient to sustain human life.

There was clearly a strong desire in the market for a new chemical fire-extinguishing agent.

Welcoming i3's environmental characteristics, the market recognised that the system does not add or take anything away from the environment. This is because it is a pure 50:50 mixture of Argon and Nitrogen, which already circulate freely and naturally in the atmosphere. The two gases have a density similar to air and so the mixture is able to retain its concentration once discharged for far longer than the now banned Halon 1301. It forms no breakdown products and therefore minimises the risk of consequential damage to the carefully balanced ecological system.

i3 reduces the ambient concentration level of oxygen when discharged in a risk area to between 10 per cent and 14 per cent; oxygen concentrations below 14 per cent cannot adequately support combustion and therefore can extinguish a fire. It is stored in high- pressure steel containers, with an operating pressure of 300bar. Alternatively, a 200bar system is available in markets where 300bar technology cannot be easily refilled. There is also the option of them being stored remotely from the protected area, as a bank of cylinders can be used to safeguard more than a single room or enclosure.

So, to organisations specifying that a non-chemical suppressant is of overriding importance, i3 is an attractive option. But, there was clearly a strong desire in the market for a new chemical fire-extinguishing agent; one with the advantages of the early Halon-like alternatives, and with the environmental profile of the inert gas systems. In short, a chemical system to complement the inert gas systems already on the market.

Sapphire – sustainable, environmentally acceptable and lasting

Sapphire is a high-performance fire extinguishing system that uses 3M Novec 1230 Fire Protection Fluid. It has a negligible impact on the environment and is designed to protect essential and delicate telecommunications and data processing equipment. It also has applications within the

cultural heritage sector protecting artefacts that would otherwise be destroyed by water from traditional sprinkler systems. Sapphire has an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces.

It is a fluid-based system that uses long-term technology that not only satisfies today's regulations, it also meets all of those in the foreseeable future. Sapphire utilises new technology and has

It is a fluid-based system that uses long-term technology that not only satisfies today's regulations, it also meets all of those in the foreseeable future.

several advantages over other extinguishing agents on the market that have unacceptably high global warming potential.

Installations around the world have shown to have an acceptable footprint, the lowest level of design concentration and the highest safety margin of any viable Halon 1301 or chemical alternative. The agent also has impressive environmental credentials with zero ozone depleting potential and a remarkably low atmospheric lifetime of just five days, compared with 107 years for Halon 1301. Sapphire has a global warming potential of just "one", against a not untypical HFC, where for the release of just one kilogramme of the HFC, 2,800 kilograms or 2.8 tonnes of the fluid would have to be released to have the same impact on climate change.

Sapphire's fluid is stored in cylinders as a low vapour pressure fluid that, when discharged, transmutes into a colourless and odourless gas. Unlike other fluid fire extinguishing agents, it can be used with absolute confidence to suppress fires involving electronic, computing or communications equipment. Typical total flooding applications use between just four and six per cent by volume of the fluid. This is well below the agent's saturation or condensation level. After discharge, the agent is dispersed through natural ventilation, leaving no residue to damage sensitive electronic equipment; it is also non-conductive and non-corrosive.

The contribution made by the discharge of environmentally damaging gaseous fire suppression systems, is dismissed by some as being inconsequential.

While certain HFCs and inert gases are used at design concentrations that are below the NOAEL or No Observed Adverse Effect Level, with safety margins that range from seven per cent to 20 per cent, no other Halon alternative comes close to Sapphire's 92 per cent safety margin.

Fast forward

If the trend in global warming continues, the increasingly widely accepted prognosis is that low-lying regions of the world will be permanent flooded, parts of the world enjoying a warm climate will become oppressively hot, and heavy rainfall may increase the prevalence of water-borne diseases like typhoid, cholera and malaria. 40 per cent of the world's population already face serious water shortages.

The contribution made by the discharge of environmentally damaging gaseous fire suppression systems, is dismissed by some as being inconsequential. After all, they argue, inert gas and chemical suppression systems are primarily used to protect business critical assets and are believed to account for little more than three per cent of the market. True, but the move to ban or at least penalise the use of environmentally unacceptable agents – perhaps through taxation – is not going to subside. Additionally, the pressure to find sustainable solutions is rightly seen as perhaps the only way of more effectively managing the world's resources and reducing waste.

So, with this combination of environmental and sustainability pressures, increasingly the only viable sustainable solutions are clean agents, such as i3, Sapphire and Inergen. IFP

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Fixed Installation Firewater Pump Packages

Internationally, there is a continuing movement towards installing more fixed installation fire sprinkler/hydrant/water-mist/deluge systems into a wider variety of sites ranging from schools and hospitals to shopping centres, manufacturing plants and distribution warehouses. Fixed fire extinguishing installations are a vital component within any overall facility design to protect life and property and their more widespread use provides facility owners with further benefits in terms of risk insurance premium reductions and reduced facility downtime in the event of an incident.

By James Shipman

Sales Manager,
Patterson Pump Ireland
Limited

The capability of the water supply to meet the water flow and pressure requirements for fixed installation extinguishing systems is of paramount importance and is determined by the extinguishing system design. Where this cannot be adequately achieved, it is necessary to incorporate fire pumps within the system.

Globally, there is a vast range of local, regional and international standards in existence for pump system design and selection. For example, within Europe nearly every country currently has its own national sprinkler and fire pump standards although much effort is being applied to introduce a harmonised European Standard EN12259 of which Part 12 will apply to fire pumps. Ultimately, when formally adopted as an EC Directive, the harmonised standards will supersede the current European national standards. However, the National Fire Protection Association Standard NFPA No. 20 (Standard for the Installation of Stationary Pumps for Fire Protection) has progressively and positively evolved since 1896 and is currently looked upon as the standard which is most widely known and adopted internationally.

In addition to designing and manufacturing to comply with the relevant codes and standards, fire pump producers also commit their products to extensive testing to obtain approvals from recognised organisations such as Factory Mutual (FM), Underwriters Laboratories (UL), Loss Prevention

Certification Board (LPCB) Great Britain, VdS Germany, etc. to enable their equipment to be installed and accepted on particular projects. These approvals are the attestation that the manufacturer has complied with the appropriate codes and standards, operates effective quality systems and provides correct product support for their equipment.

Fire pumps can work in a variety of configurations – boosting town mains water pressure directly or from intermediate water storage tanks, either above or below ground. Generally, for above ground water supply applications, 'end suction' or 'horizontal split case' centrifugal pumps are used. Below ground water applications can use an underground storage tank, river or even the open sea as their water source and for these installations 'vertical turbine' or 'submersible' pumps are generally used. Irrespective of the configuration, the final intention is to produce a certain volume of water at a certain pressure – in other words its design duty.

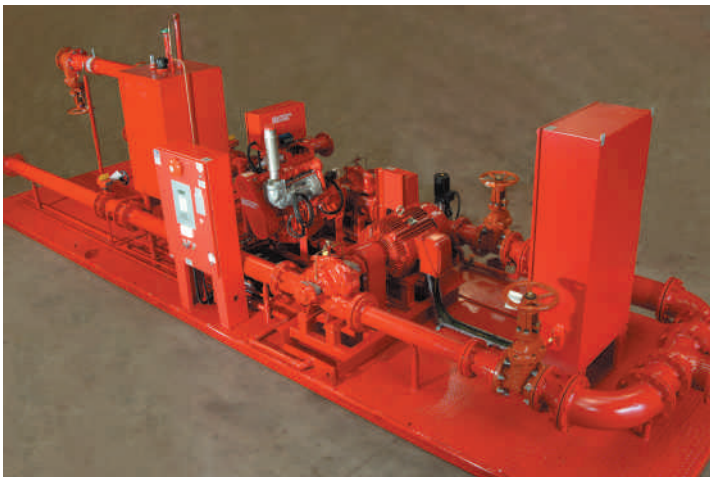
The capacity of the fire pumps required for a particular installation is determined by the extinguishing system design requirements and standards and these can typically range from 550 litres per minute (150 US Gallons per minute) to 19000 litres per minute (5000 US Gallons per minute) at pressures from 2.75 barG (40 psi) to 26 barG (390 psi). Depending on the risk insurer's philosophy, the required system design duty may be provided by a single pump system or may be shared between, say two pumps (known as 50% duty pumps) or more. Frequently, two 100% duty pumps will be installed and each one either designated as 'duty' or 'standby'. All reputable fire pump manufacturers will assist the sprinkler design consultants with determining the optimum pump system selection and specification as required.

Fire pump design and construction is developed around reliable operation. Many fire pump designs available on the market have evolved from manufacturers' proven continuous service process pump designs which have been subsequently adapted for fire pump applications. Although under normal circumstances it may only be run for 30 minutes each week for test purposes, when called on to 'operate in anger' it must start and perform flawlessly and provide firewater to the seat of the incident. This not only means installing and maintaining a reliable fire pump but also its driver, control system and accessories which form part of the overall fire pump package and must be equally as reliable.

Drivers for fire pumps comprise diesel engines, electric motors and steam turbines. Generally, spark-ignition internal combustion engines are not permitted. The popularity of using a diesel engine versus an electric motor as the fire pump driver depends on where you are. In North America it is estimated that 80% of fire pumps are electric motor driven whereas in Europe the converse is true and diesel engines account for 80% of all fire pump drivers. It is true that electric motor driven systems provide for lower overall maintenance and relatively low emissions in a more compact pump room floor area but a diesel engine driven system is virtually independent of reliability on external power sources.

Selection of the correct driver for the fire pump again depends on the codes and standards the fire pump package is being designed to. Whilst the correct pump speed is fundamental, the driver power rating will need to be sized to accommodate the absorbed power rating of the pump – for some codes this is only at the pump design capacity but for the more rigorous codes it needs to cover pump end of curve performance which demands a considerably higher power rating.

Diesel engine drivers specifically developed for fire pump applications are available. These are usually proprietary well tried and tested brands and models of diesel engines which are then dressed or customised and tested to meet specific codes and approval body requirements. Usually a de-rating factor of 10% is applied to the gross available power when used for fire pump drives but further de-ratings will need to be applied if



the engine is installed in ambient temperatures above 25°C (77°F) or 91 metres (300 feet) above sea level to compensate for reduced engine performance. Nearly all codes and standards call for dual redundant battery electric starting systems. This is to ensure reliable starting in the event of one set of batteries failing. Although radiator-cooled engines are permissible, heat exchanger cooling is the usual method with cooling water being taken directly from the discharge of the running pump via the exchanger and returned to waste or to the water storage tank.

Another essential component within the fire pump system is the automatic controller. The principle of this is to detect a fall in the firemain water pressure when a sprinkler head ruptures, deluge valve operates or a fire hydrant is opened. This is achieved via a pressure switch or pressure transducer and, when the controller is in 'automatic' mode, initiates the starting sequence and operation of the fire pump. Controllers also provide local manual operation overrides for the automatic starting system as well as remote alarm circuits to enable pump status to be monitored in a permanently manned position such as a gatehouse, reception area, building monitoring system or by the local fire brigade.

Controllers for electric motor fire pumps are relatively straightforward in design and usually employ direct-on-line (across the line) or star delta (wye delta) open transition motor starting techniques. However, when there are mains supply power limitations, more diverse starting methods are available such a primary resistor, auto-transformer or electronic soft start.

Controllers for diesel engine driven fire pumps are necessarily more complex in nature. Mostly, they will include a cyclic cranking feature to alternate between the dual redundant battery electric starting systems. A crank termination feature is also included to withdraw the starter motor from further cranking once the engine has started. In addition, both battery systems are catered for by fully automatic battery chargers operating from the pump room AC power supply ensuring that they are always in a full state of charge ready for the pump set being called into operation. Engine protective devices are limited but usually engine oil pressure and cooling water temperature are monitored with audiovisual alarms and certain codes require the inclusion of an engine overspeed protection alarm and safety trip circuit.

More and more frequently, fire pump manufacturers are being called on to provide complete pre-packaged fire pump houses. These are fully manufactured at the fire pump manufacturer's facility on a unitary baseplate including all suction and discharge valving, test lines and are ready to install immediately on delivery to the work-site. They can be supplied with (or without) a pre-fabricated pump house building fully wired out with electrical system, lighting, heating and ventilation system. Smaller capacity units can be fabricated using customised shipping containers. The increasing popularity of the pre-packaged pump house system is without doubt due to the speed and convenience of installation, requiring just fixing to the pre-prepared support base, attaching of suction and discharge lines, electrical supply and the unit is then ready to be commissioned and start its working life. A further major benefit is the elimination of site building costs associated with the construction of a conventional 'bricks and mortar' pump room and its subsequent fitting out costs.

Whilst purchasing and installing any type of fixed extinguishing system is an extremely wise measure in reducing fire risks to life and property and the associated disruption to a business when a fire incident occurs, it is absolutely essential to ensure that the fire pump system is correctly installed and commissioned. Incorrect installation can lead to serious problems later on; for example coupling failure due to incorrect or mis-alignment of the coupling halves. Reputable fire pump system manufacturers will provide local trained engineers to carry out this work to the acceptance of the facility owner and his risk insurer's requirements and also to put into effect the manufacturer's equipment warranties.

Pump system testing should be conducted by the facility owners on a weekly basis and records accurately maintained. Any abnormalities with its operation should be rectified without delay.

It is also imperative that correct regular maintenance is carried out on the system. Most fire pump system manufacturers and risk insurers require equipment to receive servicing and maintenance annually.

Remember – fire pump systems are provided for life-saving and property protection and are not something to fit and forget! IFP

Just a pretty

Premium performance CFC/HCFC-free rigid phenolic insulation from Kingspan Insulation Ltd has played a big part in a stunning office development on the banks of the Manchester Ship Canal.

By Kingspan Insulation Limited

In today's construction market, there is an increasing need for buildings to provide a feel that is professional, well-resourced, welcoming and reassuringly safe. Perhaps this is why more and more new and refurbished buildings are opting for architecturally designed high visual impact exterior finishes, lifting their image and presenting a high tech face to the world.

So how can this image be created? Simple! By using insulated render and cladding systems.

Insulated render and cladding systems are applied to the exterior walls of existing or new buildings and comprise an insulant and a weather protective finish. These exterior solutions can be described as external enveloping systems for the thermal upgrading and refurbishment of social housing, the remodelling of buildings for new uses or the construction of energy efficient new buildings. Not only can insulated render and cladding systems help to reduce CO_2 emissions but their use can contribute to the wider availability of affordable heating.

So what are the key benefits of insulated render and cladding systems? To start with, both can meet the need for improved thermal performance required by the Government and any planned changes in the Building Regulations. The building can be weather proofed, thermally upgraded with cold bridging eliminated and the appearance transformed.

Work to existing buildings can be done with minimal disruption to people in the building making it ideal for refurbishment projects. This would be of major benefit for sectors such as social housing, as tenants would not need to vacate the building, saving costs on temporary accommodation. In particular for refurbishment projects there is the added bonus of there being no impact on the footprint of the building as the insulation is applied externally.

In new buildings, the construction time can be improved cost effectively Insulated render and cladding is a simple process that, added to con-

face?

crete block or framed construction to form a solid wall, can go up faster than traditional building – yet still retain the traditional external appearance.

But, behind the façade/render lurk potential problems in terms of fire safety and thermal performance, and at the end of the day it is the functionality of such a building that matters, every bit as much as the appearance.

However, it is perfectly possible to have a safe and efficiently functioning building without losing that extra edge of a glamorous appearance. By specifying the right insulation, the risk from fire can be greatly reduced and the energy efficiency of the building enhanced, but in order to make the best choice there are a number of potential issues every specifier should be aware of.

In the first instance Building Regulations are demanding more stringent U-values, which in turn necessitate thicker layers of insulation in order to comply. With the kind of thermal conductivity offered by mineral fibre, these thicknesses can become quite significant, impinging on the usable space in the building and requiring much longer and much more expensive fixings to attach the cladding/render system to the structure of the building.

Then there is the question of longevity. It is vital for any investment in a building to last and to offer value for money. Mineral fibre can slump or sag over time, and its thermal properties reduce dramatically if it is exposed to moisture ingress or air movement.

The significance of the long term thermal performance of insulation is a given, but where the safety of the occupants in such an application is concerned, the ability to withstand fire is equally important.

So what are the options? One increasingly popular choice when specifying for medium risk fire construction is rigid phenolic insulation.

Taking the fire issue as an example, tested to BS 476, rigid phenolic insulation can achieve a Class O/Low Risk fire rating. It provides significant fire resistance and can help to maintain the integrity of the structure. This positive contribution to the robustness of the building could limit fire and smoke damage which means less structural damage, lower remedial costs and most importantly, greater chance of escape for occupants.

Then there is the question of smoke, and there are two major aspects to this. The first, and most important, is the possible effect of smoke on any occupants of the building. Many victims of fire are actually overcome by smoke and fumes rather than by the flames. The other aspect is that of smoke damage to the building. So clearly the less smoke there is – the less cost there could be, both human and financial. Rigid phenolic insulation achieves less than 5% smoke obscuration when tested to BS 5111, the best possible rating.

These attributes alone make rigid phenolic insulation products an attractive proposition, but there is far more to be gained from specifying them than fire safety. Rigid phenolic insulation is one of the most thermally efficient insulants commonly

Rigid phenolic insulation from Kingspan Insulation was chosen for the development of 47 mixed apartments, known as The Cube in Manchester, which combines cosmopolitan style and quality with practicality.

available today. With a thermal conductivity as low as 0.021 W/m.K, it can utilise the thinnest possible insulation board to achieve required U-values. It will not sag or slump, it is resistant to the passage of water vapour, unaffected by air movement and carries no condensation risk. This means that it can continue to perform at an optimum level over the life of the building. Moreover, because it is lightweight and has no loose fibres, it is easy to handle and install, requiring no specialist equipment and carrying no health and safety risk.

Rigid phenolic insulation for use in rainscreen cladding applications has been successfully tested at the Building Research Establishment to BS 8414-1: 2002 (Fire performance of external cladding systems. Test methods for non-load bearing external cladding systems applied to the face of a building) and, when assessed in accordance with BR 135, (Fire performance of external thermal insulation for walls of multi-storey buildings.) it is acceptable for use above 18 metres in accordance with the English / Welsh, Scottish and Irish Building Regulations. Since it also achieves a Class O/Low Risk fire rating and exhibits less than 5% smoke obscuration when tested to BS 5111, its fire performance is certainly not to be doubted.

With such materials available the potential is there for all types of buildings to have more than just a pretty face. Building envelopes can have an intrinsic resistance to the spread of fire, be durable, energy and space efficient, as well as looking good.

Kingspan Insulation offers an extensive range of insulation solutions for both newbuild and refurbishment projects. Specifiers, stockists and contractors are supported with a comprehensive and free technical advisory service. IFP

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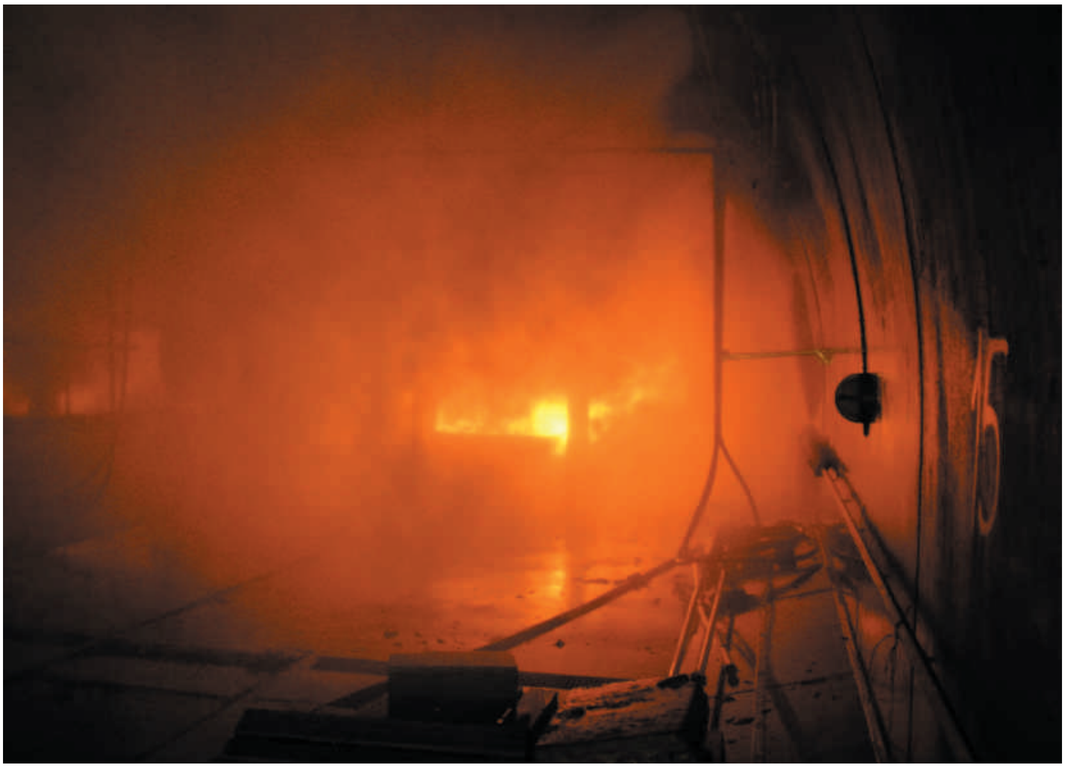


High pressure water mist improves tunnel safety

More and more people are coming to a realisation that high pressure water mist is the answer to many safety issues. In particular, where there is a need to extinguish, suppress or control a fire without using chemicals or harmful gases.

By Susan Bang

Danfoss Semco

Water mist history

The history of water mist goes back a long time, and brochures can be found describing water mist in the 1930s. The idea of water mist was revitalised in the eighties, with the Swedish company Electrolux as one of the pioneers. The modern concept of high pressure water mist spread from there to Finland and Denmark in particular, where some of the more significant pioneers of the technology are to be found.

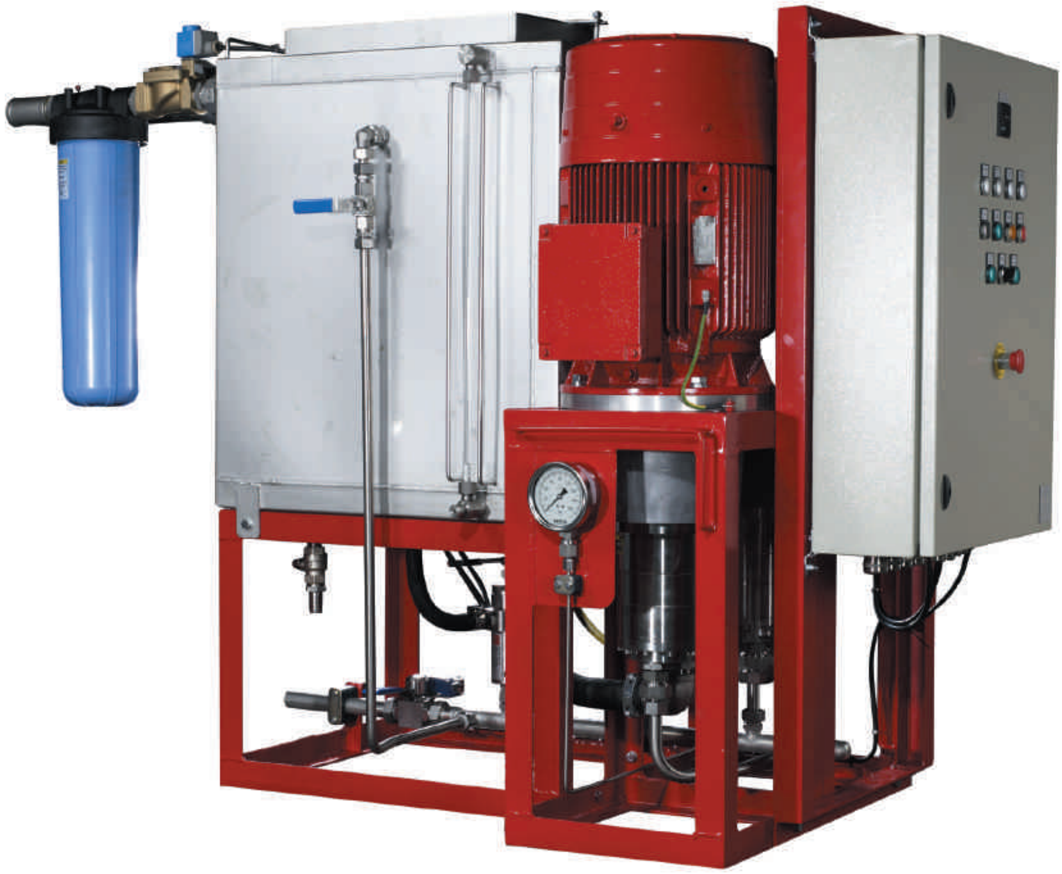
The marine industry was quick to adopt this very effective and convenient new system, and new IMO regulations soon set the standard for tests and operational functionality. These marine standards are still the benchmark for all water mist applications, including those used on land. Industry has been slow to recognise the benefits of high pressure water mist, although this situation is now changing. As a result, dedicated standards for land-based systems are now being developed, in support of the increased implementation of water mist applications in industry and construction.

Background

After several very bad tunnel fires in the late 1990s, with multiple casualties and millions of Euros of damage, tunnel safety became a major issue for several European governments. A series of programmes were initiated to investigate what might be done to improve tunnel safety.

I.e. the FIT European network on fire in tunnels ran from 2001-2004; UPTUN the best-known programme was an EU sponsored initiative that had a broad mandate to investigate tunnel safety from a variety of perspectives, and ran from 2002-2006. Wide-ranging studies were conducted on issues

A Sem-Safe compact pump unit complete with reservoir.



including concrete lining, human behaviour, detection, signals, signs, fire suppression and control, and more. Similar and complementary work was carried out under the 2004-2007 German SOLIT programme.

In 2004, EU directive 2004/54/EC became the first formal legislative document concerning tunnel safety across Europe. The directive was created in response both to the recent tunnel accidents and to the expectation of increases in border-crossing traffic across Europe. Personal unease at the prospect of entering a tunnel may also have contributed to the creation of the new directive.

The directive was not, however, very specific. Danfoss Semco believes it should be revised, taking into consideration the possibility of making the installation of an active fire control or suppression system compulsory.

The UPTUN programme

The UPTUN programme, or the 'tunnel programme' as it is often referred to, initiated a wide range of projects or work packages, among which was the work Package 2, WP2: "Fire development & mitigation measures".

Within this work package, an extensive number of fire tests were carried out to determine the nature of fire development. This included the size of possible fires, how smoke developed and the influence of ventilation. A standard fuel package was also developed, against which some actual fire suppressant systems could be tested as well as free burn fires.

Two manufacturers of high pressure systems and one low pressure system were tested against standard fuel packages in a test tunnel. More than 80 tests were performed and provided excellent data on comparative system performance and the development of fires. The tests also provided invaluable results, data and experience to the scientists and test laboratories involved, as well as to the system manufactures: knowledge and experience that would be difficult to achieve without the opportunity to participate in a programme of this kind.

As a conclusion to the test series, a real-scale fire demonstration took place in the VIRGOLO Tunnel in February 2005. All test participants were invited to take part in this demonstration, which conclusively proved the effectiveness of the high pressure systems.

The UPTUN guideline 251

The UPTUN programme produced excellent new knowledge and experience of fire development, fire mitigation, fuel packages, nozzles and equipment, smoke spread patterns and more. This valuable experience was subsequently condensed into a set of engineering guidelines: the UPTUN "Engineering Guidance for Water Based Fire Fighting Systems for the protection of Tunnels and Subsurface Facilities".

This document was created to convey some of the new knowledge to those who specify systems and equipment, as well as to share some of the experience with other manufactures.

Key findings contained in the new guidelines

It is now understood that fires in tunnels can reach heat release rates of 100 or even 200 MW within a very short time. It is not hard to imagine the level of damage a fire of this intensity could cause to human life and the physical structure of the

A typical Sem-Safe high pressure open nozzle in stainless steel.

tunnel, as well as to the wider infrastructure. Such disruption may last as long as several years, and have a potentially major economic impact. Consequently, fires need to be detected as early as possible and a fire suppression system immediately deployed to at least control the fire.

Designing an appropriate fire suppression system

The research findings revealed the need for a 'sectionised' system, in which open nozzles form sections in the upper part of the tunnel, zones of at least 30 m in length and for the full width of the tunnel, from wall to wall. Each section should have its own section valve and be connected to the main supply line.

When the nozzles are located in the upper part of a tunnel, the risk of accidental damage to the nozzles is less than if they were located at the bottom part or even in the floor.

Closed nozzles with 'bulbs' were not recommended due to the extreme speed of fire development. The problem with using a nozzle that automatically responds to a sudden rise in temperature is that it may be triggered in the wrong area of the tunnel – simply as a result of hot air and smoke being spread by the tunnel's ventilation system – wasting valuable water supplies.

The research results also showed that pump unit(s) must be capable of supplying at least two sections of the tunnel simultaneously, on the assumption that the location of the fire and direction of fire 'downstream' can be determined.

Reservoirs for water should be of a volume that will supply water for at least 30 minutes for a tunnel less than 500 m long and 60 minutes for a longer tunnel.

Of paramount concern for the long-term safe operation of a given system is the quality of the components and materials used in its design. For example, the new guidelines indicate that materials used for water supply must be stainless steel of a quality not less than AISI 316 or, for filters and other parts, non-corrosive materials like plastic. Zinc-coated carbon steel or any other coating must not be used, due to the harsh tunnel environment.

For pump units and other components, extensive recommendations govern pump capacity, power supply and design with jockey pump, section pumps, nozzles, and so on.

System reliability

One thing that is often overlooked in the design of fire control systems in tunnels is the adequate protection of the nozzles against the high levels of dirt found in the tunnel environment. The new guidelines recommend that each individual micro nozzle should be separately protected, rather than using one common cap for the whole nozzle. In the event that the mechanism fails to remove the protecting cap, conventional single-cap systems necessarily disable the entire nozzle. In contrast, by using individual caps for each micro nozzle, the failure of one cap would still allow the others to function normally.

Interfaces with other systems, for example monitoring, detection and ventilation, are essential for effective overall performance of the tunnel safety system. This need should be taken into consideration when designing systems.

All systems must be fully tested before they are formally commissioned, including the careful construction and assembly of all system components, and thorough flushing and pressure testing. Historically, these checks have not been rigorously enforced, and the new guidelines include recommendations for correctly completing these activities.

Project management

It is a major challenge to design, supply materials and components, and install a fire suppressant system in a tunnel. If the specified system needs to integrate with systems from other contractors, the challenge is even greater. It is one thing to have an excellent water mist system design, but quite another to be able to get the system into the tunnel and get it commissioned.

When a tunnel owner or operator chooses a system, consideration needs to be given to how the project should be managed and who is to undertake this key task. Experience has shown that coordinating several systems and contractors in a confined space like a tunnel, where it is critical to follow each construction phase to the letter and to make best use of each window of opportunity is not an easy task.

The more systems that can be managed by one organisation, the better. If the same organisation can be allowed to manage multiple systems, management complexity and coordination problems will be greatly reduced.

Any organisation tasked with managing a project as complex as the installation and commissioning of a tunnel fire safety system should have a proper project management tool box and extensive experience of managing similarly complex projects. Large tunnel or small, the size of the system is all that changes: the complexity of co-ordinating the installation of a water mist project stays the same.

Conclusion

High pressure water mist has developed from predominantly marine applications to a far wider range of uses, of which tunnel safety is one. In critical applications where safety is an issue for both life, property and the environment, high pressure water mist is often the very best solution. IFP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Air monitoring as part of preparedness

Firefighters throughout the world know that the quicker they can assess what it is they are dealing with, the quicker they can start work. Smoke and flames are relatively easy to see, unlike the invisible dangers that often accompany toxic or flammable gases. A source of ignition at the wrong time, or entry into a potentially lethal atmosphere could turn an incident into a full blown disaster.

By Gerd Pearson

Global Market Manager for Fire Brigades, Draeger Safety

Even if every firefighter were to don compressed air breathing apparatus for every single incident, the need for gas detection systems would still exist. Gases, particularly those from chemical and industrial plants, can have far reaching effects, from the poisoning of nearby personnel through to widespread environmental pollution. They can also have explosive consequences. The use of the right gas detection system will quickly determine the type and level of risk and allow the firefighter to do what they do best – resolve the situation with the utmost safety for all concerned.

The nature of the incident can sometimes point to the type of hazard that may be found and might provide a useful insight into which type of gas detection system may be required. An earthquake or other natural disaster, for example, might involve town gas, methane, hydrogen sulphide, sulphur dioxide, carbon monoxide or, perhaps, a lack of oxygen altogether. A terrorist incident might feature nuclear, biological or chemical hazards, whilst a wide variety of gases and vapours can be found at different industrial sites.

For instance, in the brewing industry where increased levels of nitrogen are now being used to make a more effervescent beer, there is a danger of oxygen depletion and, as a result, asphyxiation. Colourless, inert and odourless, liquid nitrogen is also used as a freezing agent in hospitals, laboratories and universities. A firefighter entering a confined space or enclosed area in the danger zone could find him or herself with a severe case of oxygen deprivation.

In steelworks, a volatile mix of oxygen and carbon monoxide can create serious blast levels and even the semiconductor industry has it's own potential toxicity problems with the use of ammonia, arsine and bromine. A "shout" at a food processing plant could involve high levels of disinfectants or, in refrigeration and cold storage areas,

unhealthy levels of ammonia. To compound the problem, it is also possible that toxic and/or flammable gases and vapours that were created during previous work might still be present, or that hazardous bi-products may be created by the fire itself from otherwise non-hazardous materials.

Whilst not exhaustive, the following lists some of the most common substances that may be encountered:

Hazards and effects

Many gases and vapours are toxic, can cause oxygen deficiency or carry the risk of explosion and, as a result can prove to be lethal.

In respiratory terms, different hazards have different effects and are classified as follows:

Narcotics

Hallucinations can follow exposure to high concentrations of toluene and other narcotic substances such as tetrachloroethylene.

Combination hazards exist in many situations and, as well as being potentially explosive or flammable in nature can make search and rescue operations very difficult indeed.

Different types of systems

The incident and location will automatically reveal a certain amount of information about the types of hazards that are most likely to be found. However, firefighters entering a potentially hazardous environment need to know exactly which gases are involved there and then, not just for their own safety but for the well being of those they may need to rescue.

SOURCE	SUBSTANCE
Combustion processes such as open fire, tobacco smoke. Vehicle exhaust gas	CO_2, CO, Nox
Cleaning agents, disinfectants, furniture polish, stain removers, shoe polish spray, nail polish remover, correction liquids, pickling agents.	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde and other aldehydes, acetone
Glues and paints	Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes
Insulating material, foams, damping material, chipboards	Styrene, formaldehyde
Gasoline stations	Toluene, benzene and other aromatics, hexane and other aliphatic hydrocarbons
Refrigerants, anti-oxidant in metal furnaces	Ammonia
Food processing, magnesium foundries	Sulphur dioxide
Semi-conductor manufacture & rework	Ammonia, bromine, hydrogen chloride, hydrogen cyanide
Paper and man-made fibres	Chlorine
Decomposing biological matter	Methane, H_2S, oxygen deficiency

Simple Asphyxiants

Inhalation of substances in this category is not usually life-threatening but the presence of a simple asphyxiant can displace oxygen in the air to such an extent that the lack of oxygen can, in itself, be dangerous. Carbon dioxide is a typical example and whilst exposure to low levels can lead to breathlessness, high concentrations can cause loss of consciousness within just 60 seconds.

Chemical Asphyxiants

Unlike other asphyxiants, these can be immediately dangerous to life and health in that they interfere with the transportation of oxygen within the body. Symptoms following exposure to carbon monoxide and hydrogen sulphide, which is produced by the combustion of polyurethane foams, for instance, include giddiness and headaches before eventual collapse. Exposure to a high concentration of hydrogen sulphide will cause an immediate paralytic effect on the respiratory system.

Irritants

Ulceration of the throat, watering eyes, sneezing and coughing are just some of the immediate symptoms that can follow exposure to irritants such as ammonia, chlorine and sulphur dioxide. Where escape is difficult, breathing can become severely restricted and exposure could prove fatal.

Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete. Whether the hazard is toxic, explosive, combustible, asphyxiating or a combination of any of those, there is an instrument to suit every situation.

Tubes

Short term tubes provide on-the-spot measurements of targeted gases and are suitable for monitoring personal exposure, spot check measurements, leak checks and confined space investigation. Developed by Draeger in 1937, for example, DraegerTubes lead the way in tube technology and enable the fast, accurate measurement of over 1000 substances, including chemical warfare agents.

These highly accurate glass tubes can also be used in conjunction with short term pumps to enable rapid measurements to be taken and provide optimum volume and flow specifications. Incorporating automatic stroke counters and a clear end of stroke indicator, pumps require no

special tools and give accurate and reproducible results.

Personal Single Gas Monitors
These handheld instruments can monitor a broad range of gases and can be supplied with interchangeable sensors to detect specific substances. Portable instruments of this kind obviously need to be lightweight, easy to read and easy to use, even when wearing gloves and the alarms should be heard, seen or felt in the most arduous of conditions.

Multi-Gas Measurements
These high performance instruments can be used to measure a wide variety of gases in virtually any situation, from indoor air quality through to confined space entry and the monitoring of landfill gas. The more modern units can provide continuous detection of up to five gases simultaneously and feature individually adjustable visual and acoustic alarms.

As each sensor is pre-calibrated and is recognised automatically by the instrument, this innovative instrument can be reconfigured simply by changing a sensor and without requiring additional service or maintenance. In addition, the measuring range of these sensors can be changed to any other gas detected by that sensor, by the push of a button and without needing recalibration. As a result, the accuracy and range of the monitored substance is substantially increased. The search for leaks in flanges, shut off devices and valves, etc., has also been simplified by the addition of a new, flexible gooseneck probe. When in tracking mode, it generates an increasing or decreasing rate of beeps in accordance with the gas concentration detected.

Other specially designed "two-in one" instruments are also available for use where combination hazards involving explosive gases and a lack or surplus of oxygen may exist. For maximum flexibility, the Draeger PacEx2, for instance, can be supplied in two versions: as an instrument for explosive gas measurement, or as a "plug and play", combination instrument for explosive gas and oxygen measurement. Combining extended operational time with minimal training and charging requirements, it features "smart" technology and is designed to monitor hazard concentrations continuously, simultaneously and independently.

Utilising three functional pushbutton controls, this rugged instrument is operational as soon as the sensors are plugged into the instrument and has a short response time.

Each of these multi-functional instruments can also be fitted with a hose or pump for active sampling in hard to reach areas. Where record keeping is a requirement, they can also be supplied with dataloggers.

Domestic preparedness has come to the fore in recent years, as the dangers of chemical and biological agents have become more of a concern. Providing continuous measurement in real-time, the Draeger Multi-IMS, for example, is easy to use and will quickly detect a wide range of chemical warfare agents. Utilising the latest state-of-the-art handheld detection and monitoring technology, it incorporates a sensor based on Open Loop Ion Mobility Spectrometry and uses an ION Mobility Cell to provide improved sensitivity and selectivity. Concentration, trend and relative

dosage measurements are easily taken and a range of graphical alarms indicate both the substance and concentration level as well as the hazard type, i.e. nerve, blister or blood/choking agent. Bar graph displays clearly show the current concentration levels as well as alarm volume and battery status. With a built-in pump and RS232 datalogging interface, it also features audible and visual alarms and an automatic self-check.

Photo ionisation detectors (PID) are perfect for tracing volatile organic substances in air. Able to detect whole groups of substances, these multi-functional, robust instruments can also be calibrated to monitor individual hazards. Especially useful in confined space measurements and emissions monitoring, they can also assist in fire investigation and in post-accident screening.

Fixed Gas Detection Systems

Designed to constantly monitor and detect explosive or toxic gases and vapours as well as oxygen deficiency and/or enrichment, these sophisticated systems can be used to sound alarms and initiate evacuation, or to switch off entire processes in the event of a problem. Used to monitor remote areas and/or multiple sites, their data is recorded which means that they can provide valuable incident information before fighters even arrive at the scene.

Providing round the clock protection for, amongst others, the petrochem, food processing and chemical industries, they are also widely used in large commercial sites and sports or leisure venues.

Firefighters have a need for rapid and accurate information about the nature of the incident. Once armed with the facts, they can respond to the numerous challenges that arise both quickly and competently. Fulfilling a vital role, gas detection systems can be used to eliminate the risks and increase awareness of the dangers.

Useful information for firefighters – sensor positioning

It makes sense that sensors and sampling points are positioned so that gas accumulations are detected before they create a significant hazard. To ensure maximum performance, different sensor positioning strategies can be implemented to suit different workplace environments. Whilst these can, of course, be combined or modified, they are generally used to provide spot, area or perimeter monitoring.

Spot monitoring is used where the potential source of the leak is known and the sensors can be positioned to ensure that leaks are detected quickly. Area monitoring requires an increased number of sensors to cover an entire area and is generally used where the source of the leak is not known. Perimeter monitoring is used in applications where the outer limits of the installation need to be checked and where it is important that potential hazardous gases do not reach neighbouring areas.

European Standard BSEN 50073:2000 lists a number of factors that should be taken into account when determining suitable locations. These include the location, i.e. indoor or outdoor site, potential sources such as the location and nature of the potential vapour/gas sources (pressure volume and/or mass, source temperature, density and distances), as well as the chemical and physical data of the potential gases/vapours present.

Other factors include leak control, the nature and concentrations of possible gas releases, the presence of cavities and jets and the general topography of the site. Air movements should also be taken into consideration as well as temperature effects, the local environment of the plant, the location and number of personnel in the plant and the location of potential sources of ignition. Any structural arrangements such as walls, troughs or partitions, which could allow gas to accumulate, should also be considered.

Perhaps most importantly, the Standard also states that the placement of the sensors and sampling points should be determined following the advice of experts having specialist knowledge of gas dispersion, experts with a knowledge of the process plant system and equipment involved, and safety and engineering personnel. It also advises that the agreement reached on the locations of sensors and sampling points should be recorded. IFP

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Fire Alarm system: Life Safety Code

Some say the Fire Alarm System is only a detection system and cannot protect life and property. Others say the Fire Alarm System has not changed much over the years. Are they partially correct or partially wrong?

By Chris Teo

Potter Electric Signal Corporation

David Goh

Vanguard Fire Systems Pte Ltd.

While it cannot physically control and extinguish a fire, it allows the raising of early warning for timely and orderly evacuation, thus it saves lives. It is customized to suit Building size, complexity and type of usage and occupancies. Automatic Fire alarm system protects property by ensuring rapid attendance by responsible personnel in the affected premise to the affected area. The alarm raised allows personnel to fight the fire manually – by way of Fire Extinguishers or Fire Hosereel as the first line of defense before the fire spreads out of control. Often, a concurrent signal is sent to the Fire Station either direct or via a Central Monitoring Station to facilitate summoning of the Fire Services.

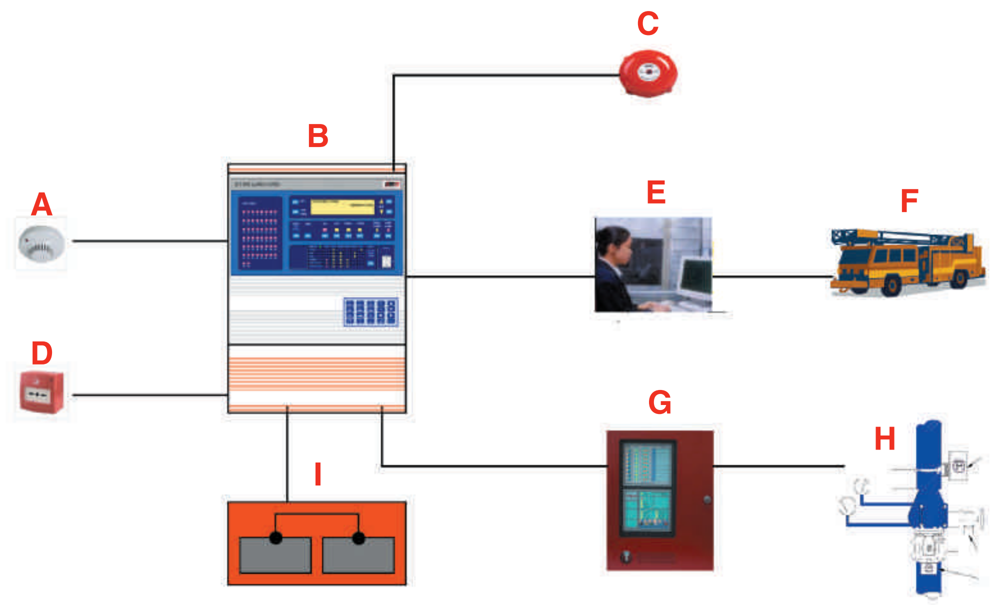
Therefore, the Fire Alarm System is very much an integral part of Life Safety Code. Without Fire Alarm System, a Visual and/or Audible alarm cannot be raised. As an example, in a Sprinkler System, a flowswitch or a Pressure Switch would not alert personnel of Sprinkler activation. Or in the event of a false sprinkler discharge, the pumpset will not be required to run unnecessarily without load!

Thus the importance placed on Fire Alarm System in the building cannot be more emphasized.

The Common Progression of Fire Protection System

In most countries, they started with the requirement for portable Fire Extinguishers as a minimum means of fire protection. The Hand-held Alarm Gong is the earliest Fire Alarm System. The Fire Alarm System is considered a 'second point of entry' into the Fire Protection Systems, together with the Hosereel. Dry Risers are employed as the building gets taller. Subsequently, as the economic situation progresses, the need for Water-based systems (Sprinkler, Waterspray, Preaction, Foam, etc) to control or extinguish a fire in Commercial and Industrial Buildings (office, shopping centers, hotel, power plant, petrochemical, warehouse, etc) are required. Of course, the type of systems become more elaborate based upon its usage. The

Components forming a Fire Detection & Fire Alarm System



From Annex D SS CP10:2005
A Fire Detector(s)
B Control and indicating Equipment
C Fire Alarm device(s)
D Manual callpoint(s)
E Fire Alarm signaling transmitter
F Alarm Monitoring station
G Control for automatic fire protection system
H Automatic fire protection equipment
I power supply equipment

Drain PCVS

Figure 1

Integral part of

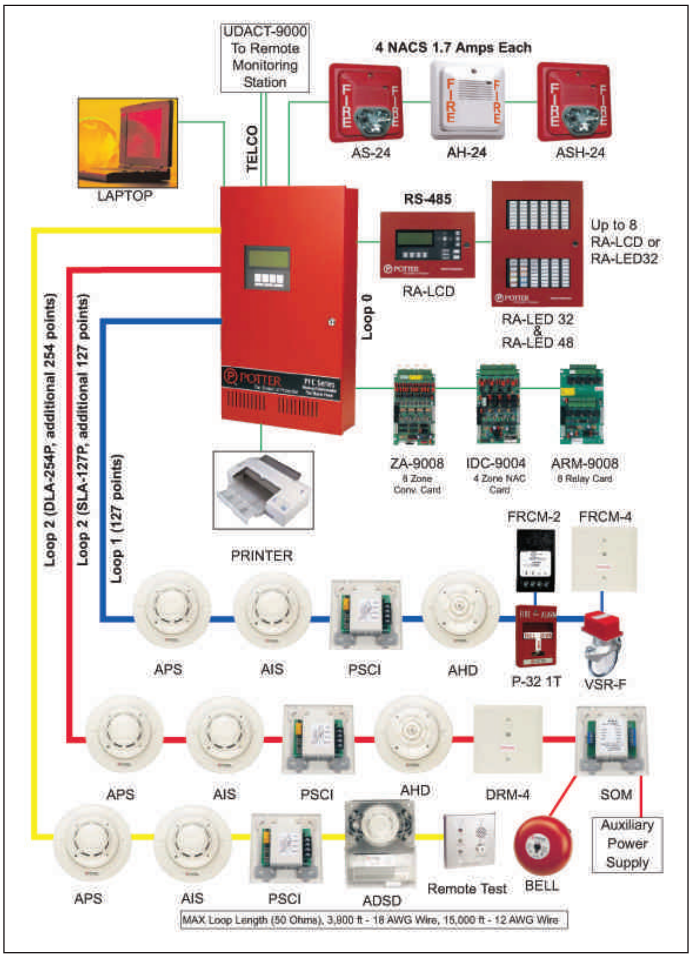


Figure 2

Fire Alarm System remains a relevant and essential system to complement any other type of Fire Protection Systems installed.

Fire Alarm System in ASEAN countries

In this issue, we are going to take a look at what ASEAN nations are doing in the use of Fire Alarm Systems, how they evolve from an adopter of foreign codes to one that is enhanced to meet the needs of the ever changing building and industrial needs. One thing to note is that due to the different stages of economic developments in the respective countries, the emphasis on the needs for Fire Protection differs.

Indeed, there have been many changes to the Fire Alarm System over the years – be it for enhancement or for meeting the specific hazards. It must be noted that the main component essentially remains unchanged (see figure 1 on previous page).

The basic components are Fire Detectors, Control and Indicating equipment, Fire alarm devices, Manual Call points, Fire Service signaling transmitter, alarm Monitoring station, Control for automatic fire protection equipment, Automatic Fire Protection equipment and Power Supply equipment.

The early days saw countries influenced by their early settlers and adopting their code. The 3 more prominent codes used are:

1 British Standard BS 5839: 2002 Part 1: Code of Practice for System Design, Installation, commissioning and Maintenance

2 National Fire Alarm Code NFPA 72: The application, installation, location, performance, and Maintenance of Fire alarm and their components.

Brunei, Malaysia and Singapore adopted the BS Standard while Thailand and Philippines use NFPA 72. Indonesia uses both BS and NFPA Standards. The recent economical development in Vietnam, Laos, Cambodia and Myanmar show adoption of codes brought in by investors. However, the need for a Fire Alarm System in any building will normally be determined by Authorities Having Jurisdiction or Fire Risk Assessment carried out by Owner, Landlord or with Risk Insurer, whichever is more stringent.

As society progresses, the economy improve, the presence of foreign investment, the affluence of its people, life and properties progressively desire protection. Local authorities having jurisdiction and Insurance companies would also demand the proper implementation of the Fire Protection systems.

Type of Fire Alarm System used

Conventional Systems are hard wired to each group of devices or Zones. A Zone represents as an area within the building, but cannot identify a specific device that is in alarm or trouble.

An Addressable System (figure 2) has been developed to provide the exact location and status of every device. The other enhancement is with regards to the ease of maintenance. Instead of reacting to an alarm, maintenance personnel can set pre-alarm level in the detectors so that preventative maintenance can be carried out. These systems are widely used in more matured markets like Brunei, Malaysia, Singapore, Thailand, and the Philippines.

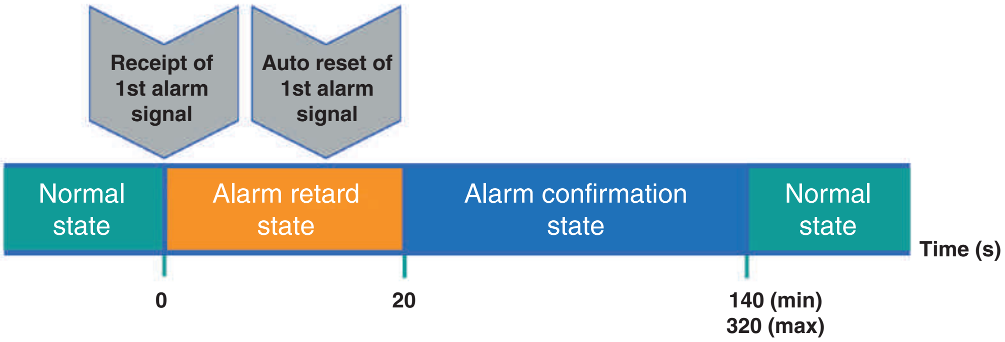
Manufacturers usually design and manufacture their Conventional and Addressable products to the acceptable international code of practices. They become a standard package used in the ASEAN countries. However, Hybrid Systems – such as Addressable System with conventional circuit or Conventional System that can identify devices activation – has been used when deemed appro-

Figure 3

False Alarm management

Alarm Verification Feature (SS CP10:2005)

To reduce the effects of transient environmental conditions which may cause various types of detectors to be activated, an automatic fire alarm system may be provided with an alarm verification feature, subject to the approval of the relevant authority.



The following components of the fire alarm system shall not be subject to this feature:
a) Alarm Zone facilities containing only manual call points;
b) Circuit between sub-alarm panels and the main alarm panels;
c) Detectors used to activated fire suppression systems;
d) Detectors installed in high risk areas; and
e) Alarm zone circuits from fire suppression systems.

priate by designer. Local Code provides guidelines for the Designer to use it as a Performance-based guideline and they have the flexibility to pick the best system for a given application.

No system is fool-proofed or free of trouble. As the needs changed, some code of practice are requiring enhance features for False Alarm Management and Evacuation Operation. Features like Alarm Verification feature (AVF) (figure 3), History Log, PC Interface with Building Management System (BMS) are gaining popularity. AVF, adopted from Australian Standard, is a feature of automatic fire detection and alarm systems to reduce unwanted alarms wherein a Smoke Detectors report alarm conditions for a minimum period of time, or confirm alarm condition within a given time period after reset, in order to be accepted as a valid alarm initiating signal. Restricted Alarms allow appointed staff in the premises to investigate the fire alarm activation prior to sounding the evacuation signal.

The LCD Display is used to evaluate the event log check or history buffer, which can alert maintenance personnel of any potential false alarm or trouble. However, the LED Display is usually the choice for use due to the diversity of languages and Code of Practice in the ASEAN region. Some countries would prefer LED to work in conjunction with a Mimic Panel for quick identification of Fire location.

For large and sophisticated projects that spread over a large area, time is of utmost essence. In projects like tall Skyscrapers, Mega Warehouse, Power Station, Petrochemical Plant, Pharmaceutical Plant and Airport there may be a need for a Fire Control Centre where console and computer systems are used to quickly identify trouble spots. CCTV and Emergency Voice Communication Systems are also employed to complement all other Fire Protection and Detection Systems installed.

These features are to minimize the occurrences of false or unwanted alarm which resulted in downtime to the operation of businesses and inconvenience to occupiers/tenant of building. In the current competitive business environment, unplanned shutdown in an operation or facility may mean thousand or million of dollars lost.

In Evacuation Operations, Restricted Alarm, Multistage Alarm, and Messaging via Pager or Mobile phone to key personal are also becoming common. Multistage or Phased Evacuation is a system in which different parts of the premises are evacuated in a controlled sequence of phases; those parts of the premises expected to be at the greatest risk being evacuated first.

Special Hazard Fire Alarm System

With more Computer Rooms, Servers Rooms, Communication Rooms and other Special Hazards, separate Fire Alarm Panels are required to manage the discharge of systems such as Gas, Foam, and Powder Systems. While there is a need to react to a Fire Condition quickly, it also must be able to minimize any activation arising from a false alarm. The premature activation or discharging a Gas System can be costly. For Foam/Powder System, the damage to equipment and clean-up of the discharged content can be massive. Thus Dual-risk circuit is an enhancement feature to allow the activation of a system when a second detector verifies that there is a fire. Discharge Countdown enables the abortion of system before a pre-set time expires and actuates the system.

Going Forward

With the rapid integration of ASEAN, there may come a time when an integration of Code of Practice in the Fire Life Safety be adopted for a consistent practice, just like those in the European Union. Having a uniform code of practice may not be a priority of ASEAN members but going forward, a unified practice may provide peace of mind for Citizens, Tourist and Investors alike. The countries that are currently developing their economies have the advantage of adopting the most modern system available in the market. IFP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Incipient fire detection in hazardous areas

The market for High Sensitivity Smoke Detection systems has grown rapidly in recent years. Of several factors favouring aspirating smoke detection, the most significant is that this category of detector is usually capable of providing a significantly earlier warning of fire compared to other detection technologies.

By Peter Fox

AirSense Technology Ltd

Background

For those unfamiliar with this type of system, it should be explained that they are often capable of providing warning of incipient fire, or pre-fire situations, especially in applications where more conventional detection systems struggle badly, such as the high airflow environments found in Electronic Data Processing (computing) and telecommunications and control-room areas. Some types of aspirating High Sensitivity detectors are also suitable for use in hot, cold, dusty, dirty and other 'difficult to protect' environments, especially if they are equipped with both dust-discrimination and filtration technologies. If the performance between detection techniques is compared in a high airflow environment, a conventional 'point' detection system would typically be capable of detecting a fully developed 'flaming' fire with a substantial heat output, whereas a High Sensitivity system such as Stratos-HSSD would be capable of detecting an electrically overloading electronic component or wire in the same environment. This is obviously a step-change difference in protection level, and it is important to appreciate that the application of an early-warning (BFPSA category 1) system may often result in fire prevention, rather than fire detection.

Hazardous area detection problems

Hazardous areas are typically found in areas such as petrochemical, pharmaceutical and chemical sites such as refineries, oil production areas, etc. It is a great irony that while the market for 'early-warning' detection has matured so fully for so many applications, hazardous/explosive atmosphere environments have effectively been unable to benefit from the substantial advantage provided by this type of early-warning fire detection system. It is a category that should demand the most reliable and earliest-warning automatic fire detection system possible, due to the possible consequences of even a tiny fire incident, but it is also one that has been effectively limited to inferior detection technology due to the vitally important requirement for Hazardous area certified protection products.

There have been attempts to introduce certified Hazardous area aspirating detectors in the past.

The production of a fully certified Hazardous area aspirating detector poses substantial difficulties. The requirement is that the electronic and optical laser detection components be housed in a sturdy metal enclosure (capable of withstanding explosion), and that air entering the detector be passed through certified 'flame traps', which must also be capable of free passage of air from the hazardous area. Flame-traps are fitted on both the inlet and exhaust of the detector, which prevents the electronic circuitry contained in the detector from becoming an explosion source. The flame traps allow (somewhat restricted) passage of air sample, but completely segregate the internal chamber from being capable of passing a flame-front from any explosion or explosion initiation source in the enclosure. These flame traps usually take the form of deep-pored corrugated, rolled metal strip, a coarsely sintered baffle (compacted metallic granules) or compacted wire mesh.

There have been attempts to introduce certified Hazardous area aspirating detectors in the past, but despite seemingly being the ideal detection solution to what must be some of the most demanding detection requirements on the planet, they have been unsuccessful. This is because they have been seriously flawed on four counts:

1. **Weight.** The requirement for the detector to be housed in an explosion-proof enclosure has meant that previous attempts to build this type of detector by simply mounting the internals from a 'standard' aspirating detector in a proprietary explosion-proof enclosure has made them impractically heavy (typically weighing in at a hefty 40kg and an earlier attempt at more than 70kg!), which presents obvious difficulties for fire detection installation!
2. **Serious air filtration difficulties.** Serious air-filtration difficulties have occurred in the past with earlier attempts at Hazardous duty aspirating detector design because the air entering the aspirating detector enclosure has to pass through a flame-trap, which has a side-effect of forming an effective 'strainer' or 'sieve' for the incoming air sample. When the flame-trap is new, the size of the pores are easily large enough to allow smoke sized particles free passage to the detector, but because the air sample entering the flame-trap is unfiltered on earlier generation products, any dust and dirt in the air sample begins to accumulate in the pores of the flame-trap, and as it builds up, the compacted dust begins to form an effective, fine porosity air filter. The problem with this is that after a surprisingly short time, this compacted dust can substantially reduce or even prevent smoke particles from being transported through the flame trap to the detector. The seemingly obvious solution of employing airflow monitoring to detect this situation is not an option, because the flow-rate reduction caused by this lightly compacted dust/dirt is insignificant. It can be difficult to check for this problem on any

installed earlier generation systems, because it is generally difficult to perform fire tests in a Hazardous classification area to check for any impairment in detector performance.

3 **Problems for routine maintenance.** A problem in Hazardous or potentially explosive environments is that electronic components cannot be allowed uninterrupted contact with a potentially hazardous or explosive atmosphere. This makes it problematic to open the detector enclosure for routine service, such as renewing an air filter, and this can be an insurmountable problem for some sites, where opening the enclosure to gain filter access while in service is not an option.

4 **High cost.** Costs have been extremely high, partly because the only previous manufacturer had a monopoly, but also because at substantial weight, the transportation, handling and installation of such a detector was costly, usually requiring the use of specialised mechanical handling equipment.

A new solution

AirSense Technology Ltd of Hitchin, UK has long been considered a market leader in the field of High Sensitivity aspirating Smoke Detection products. With an unmatched depth of experience, dating back to the late 1970s, which has led to such successful products as the multiple Queen's Award-winning Stratos-HSSD® range. AirSense have now drawn upon this depth of experience in producing an ATEX certified hazardous area detector called Stratos-Ex™. The ATEX certification (EEx d IIB + H_2) makes Stratos-Ex suitable for use in hazardous areas where the explosion risk is presented by gases or vapours in ATEX groups A, B or Hydrogen. The Hydrogen classification is of particular interest where battery rooms need to be protected, as in certain circumstances accumulators can vent hydrogen, and it is the highest level of hazardous area certification ever achieved by an aspirating smoke detector.

The Hydrogen classification is of particular interest where battery rooms need to be protected.

Stratos-Ex uses the same laser detection system as used in the Stratos-HSSD range, acknowledged as being the most sensitive of High Sensitivity aspirating systems, thus providing the earliest of early-warning systems. The circuitry is closely based upon the highly successful Stratos-Micra product, but is miniaturised further to be housed in a purpose designed cast aluminium alloy enclosure, with a circular glass viewing window in the lid providing the customary 'OK', 'Fire' and 'Fault' visual signals. Despite being housed in a sturdy explosion proof enclosure, the all-up weight of Stratos-Ex is a relatively tiny 8.5kg, making installation an easy, one-man affair. Stratos-Ex is designed to communicate with the Fire Alarm system with a range of AirSense designed Addressable Protocol Interface Cards, allowing it to communicate seamlessly with a range of popular addressable analogue-addressable fire alarm systems.

Programming, diagnostic and set-up facilities are provided by hard-wired connection over the serial bus, meaning that there should be no reason to need to open the enclosure. Alternatively, interfacing can be accomplished using the on-board relays or via the SenseNET serial communications bus. Using the SenseNET bus allows a range of additional products to be networked with Stratos-Ex providing more comprehensive displays to be mounted in a safe (non-hazardous) area, a dedicated supervisory control PC software package or a Command Module which can interface a large number of Stratos-Ex detectors to Modbus. The serial protocol used in Stratos-Ex is fully compatible with other AirSense products, which is useful for mixed systems where some Stratos-Ex and some conventional Stratos-HSSD® units are to be used to protect different areas of a building.

Programming, diagnostic and set-up facilities are provided by hard-wired connection over the serial bus.

It was recognised that Stratos-Ex had to be simple to maintain, not requiring opening of the sealed enclosure for service, and a filtration system is positioned upstream of the flame traps to prevent them suffering from dust/dirt build-up. This is in acknowledgement of the now well-understood problems of gradual smoke removal, with resultant desensitisation of the system if the filter were located in the 'normal' position in an aspirating smoke detection system. The Stratos-Ex dust filter is substantially larger in capacity than 'normal' aspirating smoke detection system filters because there is no (AirSense patented) 'bypass' on Stratos-Ex, such as is employed in other AirSense Technology products, and which has the effect of greatly prolonging filter service life. As there are no powered parts in the Stratos-Ex dust-filter assembly, there can be no explosion risk in undertaking routine service.

Stratos-Ex employs the AirSense patented ClassiFire® Perceptive Artificial Intelligence algorithm. This provides substantial advantages: simple and fully automatic set-up, true monitoring of air filter condition (other systems use a simple timer!) plus a unique compensation system to prevent a partially dust laden dust filter from causing a reduction in a system's performance, allowing Stratos detectors to maintain a consistent degree of protection (any aspirating system employing a filter will suffer from this problem unless a system such as ClassiFire is employed). ClassiFire also allows Stratos-Ex to switch sensitivity if there is any difference in ambient smoke density between operational and non-operation periods. It makes these switches in sensitivity automatically, without the need for external input, with the decision being made by the product's class-leading in-built ClassiFire Artificial Intelligence system.

Stratos-Ex provides four staged warning levels, which would be used typically to indicate the degree of seriousness of the potential fire situation. IFP

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NITTAN

When Response Time Matters

The Nittan Model 2RA-P is a point type flame detector capable of providing a very fast response due to its high sensitivity. It is a sensor with state-of-the-art technology that drastically reduces the occurrence of false alarms whilst remaining highly sensitive.

It detects infrared energy emitted in fire and sends a signal to an automatic fire alarm system or to a fire alarm control panel.

It is capable of providing a supervision distance of 17m ~ 30m and a supervision angle of 100º Max.

For the detection of Infrared energy, a “pyro-electric effect” is used to detect the flicker frequency of the flame (1 – 10 Hz) and monitor the special characteristics of CO_2 resonant emission from the flame (wavelength of 4.3μm), as well as a non-fire-alarm discrimination wavelength region (around 4.0μm), thus, increasing the reliability of the detector with respect to false alarms.

The 2RA-P declares a fire only if the following condition is reached:

CO_2 Resonant Emission Signal level > Non Fire Alarm Signal Level.

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Topping each of the tunnels, at either end, the plant rooms house high power fans that ram air into a wedge shaped chamber to emerge at high level in the tunnels via the Saccardo nozzles. These deliver fresh air during normal operation but can also pressurise the tunnels in an emergency to exclude smoke and fume and create an escape route.

Tunnel ventilation improves Fire and Emergency Security

The English side of the high speed rail link between Paris and London will open this year. The 39km line into central London has three lengths of twin-bore tunnels of more than 21km featuring pioneering ventilation technology for use in the event of fire or other emergency. Phil Doyle of ventilation contractor, Senior Hargreaves, explains the technical challenges.

By Phil Doyle

Ventilation contractor, Senior Hargreaves

The Infrastructure

The final phase of the Channel Tunnel Rail Link (CTRL), represents a total investment of £3.3 billion. Tunnelling more than half the route absorbed much of this cost. St Pancras International is the rail hub linking central London to the rest of the UK; from here the line passes through the first 7.5km long tunnel to the Stratford box, a walled cutting of 1.1km. This is at the centre of a huge new development called 'Stratford City', where a new international station will service the Olympic Village for the 2012 games.

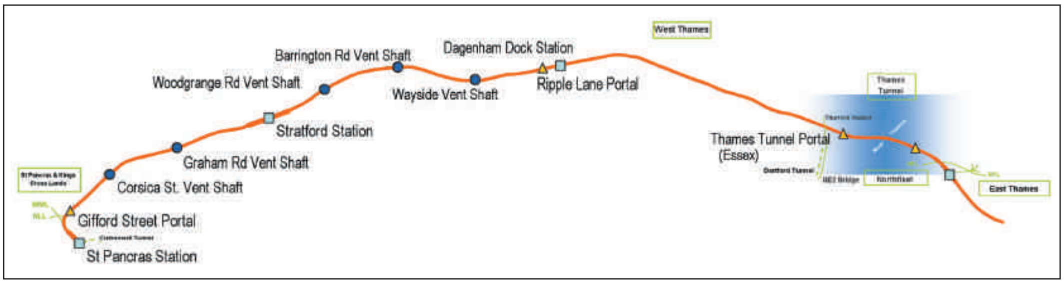
From Stratford, the line passes through the second London tunnel of 10.5km before travelling overland and passing the London orbital motorway, the M25, to the river Thames. A tunnel of 3.2km takes the line under the Thames at Essex north bank into Kent. The line then continues on the surface to join the existing high speed line to the Channel Tunnel and on to France.

The need to ensure fire safety in the tunnels, recognising the new potential risks, has created technical and logistical challenges for which unique solutions have been required.

Safety Principles

Consultants, Parsons Brinkerhoff, undertook the tunnel ventilation design and modelling. They

Over some sections, the tunnels follow the line of an existing surface railway. This minimised the disturbance to homes and businesses on the surface, but restricted the available area for service shafts and their associated plant rooms and infrastructure.



devised a system of ventilation to meet everyday needs and to give protection in an emergency. This ensures that if there is a serious incident in any of the tunnels, then the adjoining tunnel – linked by cross passageways and protected by fire doors – will become a place of safe refuge and an exit route.

The primary role of ventilation is to pressurise the safe area and so exclude smoke and fumes. Additionally, airflow in the tunnel affected by the incident is regulated to remove fumes and products of combustion to contain the hazard. It will also introduce fresh air remotely to allow emergency services to approach the incident with greater visibility and safety.

In non-emergency situations, like a train held in a tunnel or while maintenance work is in progress, the ventilation system can deliver fresh air for general comfort. During the later phases of fit-out, the ventilation systems operated this way to improve working conditions for the contractors installing track, signals and other equipment.

Powered ventilation throughout the scheme ensures the right air volumes can be delivered reliably and give flexibility and control over airflow. This has also reduced the number of service shafts needed. The longer 10.5km London tunnel has three service shafts and the shorter has two.

The Thames Tunnel Ventilation

The requirements of the Thames tunnel differ from those of the longer London tunnels and so different techniques are used to achieve the same goal. Sinking ventilation shafts close to the banks of the Thames would have been expensive and posed technical problems. A novel solution has therefore been adopted using powerful fans at both ends of each tunnel.

At both the northern and southern ends of the Thames tunnels, plant rooms top the tunnels. Each of these is fitted with a bank of four 1.6m diameter fans rated at 155Kw. The system demands only three fans to be operational at any one time to deliver the correct air volume of 175 cubic metres per second. The remaining fan provides back-up and continuity during maintenance. Fläkt Woods specially engineered these fans and the fire-rated fans in the tunnel ventilation shafts.

Air is driven from the fans through a tapered chamber, known as a Saccardo nozzle. This is discharged through a narrow slot at high level in the tunnel, reaching an exit velocity of 34 metres per second. These systems, operating at both ends of the evacuation tunnel, will give the pressurisation necessary to contain smoke from an incident in the adjoining tunnel. A single Saccardo system operated at either end of the incident tunnel can provide cover for emergency services to gain access to the incident with less risk.

The London Tunnels

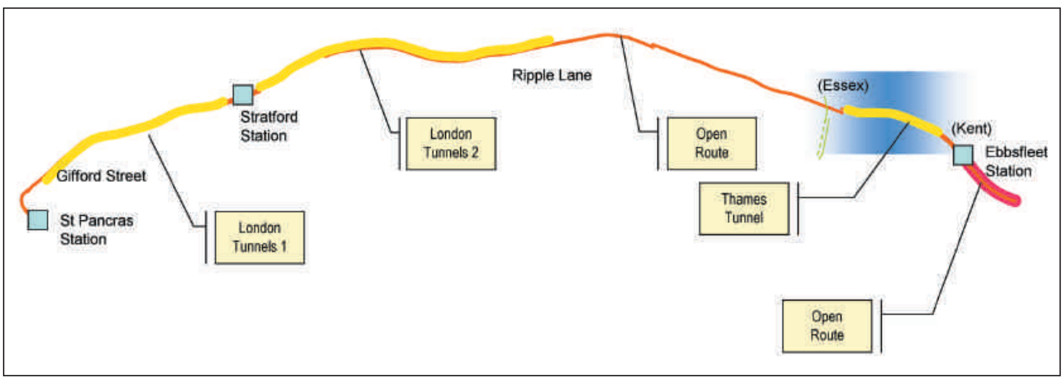
On the London tunnels, there is a different solution. These tunnels are located up to 40 metres below ground level and service shafts provide ventilation, power and personnel access. Head-house buildings, close to the top of each shaft, contain plant rooms for power and switchgear. The control rooms have conventional heating and ventilation systems to ensure comfort for personnel and efficient plant operation. These HVAC systems were also part of the Hargreaves contract with EMCOR Rail.

Each shaft houses twin ducts with reversible fans to inject or extract air from the corresponding tunnel. As an incident could arise anywhere on this underground network, all fans and ductwork are fire rated to withstand extended exposure to high temperatures.

Within the tunnels, reversible jet fans are installed that can induce airflow in either direction supporting the flow pattern induced by the fans in the ventilation shafts. A sophisticated monitoring and control system, supplied by Johnson Controls, determines the direction of airflow required to deal with daily or emergency needs.

Because the line passes through built-up areas, noise break-out from shafts and tunnel ends required special attention. Attenuators fitted above and below the fans take care of this. In addition, fan units are sprung and have flexible

London tunnels one and two are connected at the centre to the Stratford Box, a walled cutting at the centre of which is Stratford International station. This will service the 2012 Olympic site and eventually the area of regeneration that will be known as Stratford City.



Designed to deliver air at high velocity into the Thames tunnels, the Saccardo nozzles must also withstand extreme external pressures from passing high-speed trains. The nozzles incorporate suitable support and stiffening steelwork made from heavier gauge steel.

plastic connecting skirts to avoid resonance of the ductwork due to vibration.

Special Engineering Considerations

The long term, low maintenance, performance of equipment is essential and contractors have to guarantee fixed equipment for 25 years. Hargreaves ductwork, working platforms and support steelwork is therefore galvanised or hot metal sprayed to give lasting protection.

A further consideration has been the design needs for equipment to withstand air pressure from trains travelling at up to 230km/h (143mph) through the tunnels. This induces large positive pressures ahead of the train and a negative pressure behind it with a near instantaneous swing between the two extremes. To withstand these immense forces, Hargreaves has fabricated the ductwork in heavy gauges with additional stiffening and reinforcement where appropriate. This is particularly evident on the Saccardo nozzles in the roof of the Thames tunnels.

Senior Hargreaves and the other contractors faced considerable logistical problems. The ventilation systems and associated structural steelwork in each shaft serving the tunnels weigh around 100 tonnes. Structural steelwork and platforms alone account for 30 tonnes, attenuators a further 30 tonnes and pressure relief dampers almost 20 tonnes. The system comprised hundreds of individual elements, all of which needed to be built and moved up to site in the precise assembly sequence.

Storage space at many locations was limited. Access was also limited to specific times of the day because of the need to avoid disturbance to residents and local businesses or the transport of the loads at peak times. Close coordination between the Hargreaves factory and galvanising and coating contractors in the north of England, transport operators and on-site management 300km away in London, was essential and ensured precise delivery to schedule and in sequence.

Conclusion

Just imagine linking the capitals of Scotland, England and France in one rail journey; breakfast in Edinburgh, lunch in London and ample time to see the sights of Paris before dinner. Trans-continental rail travel will transform both leisure and business travel. Building this final link has been a massive effort of civil and mechanical engineering.

As most passengers speed below London's suburbs at over 140mph, they will be unaware of the sophisticated systems that support their safety. However, the engineers and contractors such as Hargreaves that have worked together to create these pioneering tunnels, setting new technical standards along the way, know they have paved the way for the next phase of ground breaking rail projects. IFP

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Website: www.hargreaves-ductwork.co.uk

Pic courtesy of PPG Industries Netherlands B.V.

Structural Steel Fire Protection

Is the fire protection of building elements, such as steel, a new thing? Well, in order to fire protect you have to know what is needed and then have the products available to fulfil the need. This means fire codes and the appropriate fire resistive products.

By Graham Ellicott

Chief Executive, Association for Specialist Fire Protection (ASFP)

As early as 300 BC the Romans were using slave labour to staff their fire department in Rome. The slaves' response to emergency situations is reported to have been quite slow and indeed, paid officials eventually replaced them. This force had grown to about 7,000 by AD 25 and its main aim was fire prevention, which it enforced on some occasions by the use of corporal punishment! It is from these early days of fire prevention that codes dealing with fire in buildings such as the Building Regulations, Approved Document B have evolved.

David Hartley was issued a patent in England in 1722 which detailed a system of metal plates separated by sand and this was installed in many houses to prevent the spread of fire from one floor to another. Thus, the first compartmentation system was developed.

In 1791 a group of leading London architects formed a club known as The Associated Architects and in 1792 they decided to ascertain if *'practicable and not expensive means might be devised which will confine a fire to one room in a house'*. They evaluated several systems that were to be the precursors of modern day passive fire protection products. These included another of Hartley's ideas, which involved the nailing of very thin wrought-iron sheets around timber joists. In addition to this, they also looked at the Earl of Stanhope's "stucco" to prevent the passage of fire through ceilings and floors and Henry Wood's liquid fireproofing. In these early prototype systems we have the forerunners of today's board encasement products, cementitious fire protection materials and thin film fire resistive coatings.

In 1855 Sir Henry Bessemer developed the Bessemer furnace enabling the world to make steel in commercial quantities. The coming together of Bessemer's steel production process and the ideas of the likes of David Hartley, the Earl of Stanhope and Henry Wood, have led to the ability of today's architects and engineers to design steel framed buildings that can be protected from fire to save life and property.

But 'why protect steel from fire as it doesn't burn?', is an often asked question.

At temperatures above 550°C steel under load will start to lose its design margin of safety and begin to buckle and thus, building compartmentation and integrity will be destroyed. In order to delay this loss, steel members need to be protected with products that will slow down their temperature rise. In addition, these products will need to be durable enough to withstand the velocity of the fire and in some cases direct flame impingement. In most cases steel will only be exposed to a

At temperatures above 550°C steel under load will start to lose its design margin of safety and begin to buckle and thus, building compartmentation and integrity will be destroyed.

cellulosic fire such as might occur in a normal commercial building, however in the case of steel used in a petrochemical complex the fire is likely to be far more intense. This type of fire is known as a hydrocarbon fire, where temperatures will reach 1000°C within minutes.

Its size and the type of fire that it is likely to encounter determine the amount of fire protection required by a steel member. 'Heavier' steel requires less fire protection than 'lighter' steel to achieve the same level of protection when exposed to the same type of fire. In general, the 'heaviness' of the steel is determined by the ratio of its perimeter, that is to be exposed to the fire, to its cross sectional area. In the UK this is referred to as the Sectional Factor and the higher the ratio, the more the fire protection that is required to achieve the desired level of fire protection.

ASFP
ASSOCIATION FOR SPECIALIST FIRE PROTECTION

In conjunction with the Fire Test Study Group (FTSG) and the Steel Construction Institute (SCI), the Association for Specialist Fire Protection (ASFP) publishes 'Fire Protection for Structural Steel in Buildings'. Currently in its 3rd Edition (print copy and freely downloadable from the ASFP website at www.asfp.org.uk), this publication is also known to its users as the 'Yellow Book' and is recognised as the industry guide to both testing and product approval. The 'Yellow Book' contains third party reviews of test reports and assessments for passive fire protection products.

The UK is unique in the world as it has the largest selection of products for the fire protection of structural steel.

Cementitious products based on gypsum or portland cement binders are normally applied by low pressure spray techniques to the profile of the steel section to be protected. These materials contain low density aggregates and rheological aids to help the application characteristics. Fire protection is provided to the steel by these materials in two ways, the first being the 'cooling effect' as the trapped moisture (physically and chemically bound) evaporates as the temperature of the surrounding fire increases. Once all the moisture has turned to steam the product then behaves as a thermal insulation material. Low density mineral and synthetic aggregates are used in these products as they are efficient in allowing the steam to escape, while denser materials might impede its progress and cause the product to spall.

Board and casing systems composed of various materials such as ceramic wool, mineral wool, fire resistant plasterboard, calcium silicate and vermiculite are also used to provide fire protection to steel. These products provide fire protection to steel in much the same way as the cementitious products and are dry fixed around the steel using clip, pin, noggin and screw systems.

Intumescent coatings are the third generic type of fire protection for structural steel. These products derive their name from the Latin verb, tumescere which means to begin to swell. In a fire situation, these thin film products swell up to form a char which protects the steel thanks to its insulating properties. Using various types of industrial coating equipment these materials are applied as a thin film and are often available in a range of colours, so that the designer can achieve his or her aesthetic needs as well as those of fire protection on visible steel.

The use of any product can be undermined by poor application, however. For fire protection, any work that is not of the correct quality can lead to premature collapse of a building in a fire situation, which in turn could threaten the lives of the occupants and the firefighters. Thus, it is imperative that contractors who have the appropriate credentials for the work install passive fire protection products for steel, fully in accordance with the manufacturer's instructions.

It is the strong recommendation of the ASFP that structural steel fire protection products be installed by companies that are members of 'Third Party' Certification schemes and who are members of a trade association with an enforceable code of practice.

Coming right up to date, the ASFP is intent on carrying on the tradition of the continuous improvement of all aspects of the passive fire protection industry.

The consideration of the effects of fire on the structural elements of a building started with the Romans and progressed to David Hartley, who with his eighteenth century compartmentation plate and sand barriers was the first person to gain a patent on a passive fire protection system. Coming right up to date, the ASFP is intent on carrying on the tradition of the continuous improvement of all aspects of the passive fire protection industry. IFP

New total porta premium-brand

Tyco Fire Suppression Group has launched an extensive new range of portable extinguishers in the UK under the TOTAL brand. John Allen, EMEA Marketing Director of Tyco Fire & Security's Fire Suppression Group explains what sets them apart in the market, and describes some of the innovative special application portables that are in the new line-up.

By John Allen

EMEA Marketing Director
Tyco Fire & Security's
Fire Suppression Group

Internationally-approved and manufactured in Germany to the industry's most exacting standards, the new TOTAL range of portable extinguishers comprises models that are suitable for Class A, B, C, D and F fires. The TOTAL offering also includes several unique speciality portable extinguishers, each of which is designed to satisfy particular fire safety challenges or market needs.

These specials include powder portables for metal and coal fires; antimagnetic CO_2 portables for hospitals and clinics; specially-formulated water portables for sawdust fires; wet chemical portables for cooking oil and fat fires, and purpose-designed foam portables for polar liquid fires. Engineers at Tyco's dedicated portables research and manufacturing facility in Neuruppin in Germany, where the TOTAL portables are produced, have also devised a unique "tandem" portable/automatic extinguisher. This doubles up as a fixed, automatic extinguisher for protecting unattended fire risks.

Build quality

Significantly, for the growing number of buyers concerned about the quality of some portables now on the market, all of these new TOTAL portables are manufactured from specially formulated steel – with the exception of the antimagnetic extinguisher – that remains flexible after heating and welding. They have a one-millimetre-thick internal powder coating that is widely recognised as the industry's most hardwearing surface, providing the best corrosion resistance.

Each and every cylinder is electrode-tested to ensure there are no pin-point flaws in the internal coating, and the quality of the external finish can be judged by the fact that there is a complete absence of colour fading, which is a common feature of many inferior quality cylinders. Even the cylinder wall-mounting brackets are designed to ensure there is no metal-to-metal or metal-to-wall scuffing. Each and every cylinder is uniquely numbered to provide a complete and reliable quality audit trail.

bles offer performance

Reducing the risk from metal fires

One of the new TOTAL portables is specifically designed to fight metal fires that, typically, can reach temperatures in excess of 2000°C. It is aimed at metalworking production areas in vehicle manufacturing and household appliance plants where there is a risk of light metal and alloy waste catching fire during machining operations. It will, undoubtedly, also interest safety officers in the chemical industry, in nuclear power plants and laboratories.

A purpose-designed nozzle ensures gentle application, further reducing the risk to the extinguisher operator.

The new TOTAL extinguisher is suitable for such metals as magnesium, aluminium, potassium, sodium, calcium and lithium. Unlike conventional Class D portable extinguishers that use agents with a high risk of chemical reaction, the new extinguisher uses a specially developed TOTALIT M metal-fire powder extinguishant that works by forming a crust on the combustible surface, depriving the fire of oxygen. A purpose-designed nozzle ensures gentle application, further reducing the risk to the extinguisher operator. Two models are available, a 12kg hand-held portable and a 50kg wheel-mounted unit. Both feature a 1.5-metre hose and an extended-length lance.

Tackling coal & dust fires

Two portable extinguishers have been introduced that are designed to fight coal dust and other dust fires, particularly in the mining and quarrying industries. The new TOTAL extinguishers have specially designed applicators that provide a smooth covering of the fire, so markedly reducing the kinetic energy of the extinguishant flow and the risk of explosion. This is claimed to be a major step forward in mine and quarry fire safety, as even the smallest amount of kinetic energy can initiate an explosion.

The new extinguishers are filled with an ABC powder with a high MAP content. Should a fire occur, the internal CO_2 [carbon dioxide] propellant bottle is activated by a knock-down button. Two models are available: a 6kg coal dust extinguisher that, with the applicator removed, can also be used as a standard extinguisher for Class A, B and C fires, and a 10kg mine and quarry portable. The 10kg extinguisher is designed for use in the most extreme environments. It is protected against the ingress of fine dust by a special cap that protects the valve and hose against vibration or impact damage.

New antimagnetic portable

An antimagnetic portable has been developed for hospitals, health centres, clinics and other locations where magnetic interference could potentially damage sensitive equipment or put equipment performance in doubt or at risk.

The new 5kg TOTAL CO_2 extinguisher is suitable for Class B fires involving flammable liquids or liquefiable solids, and is constructed entirely from non-magnetic materials. It is also safe to use on electrical equipment up to 1000v at one-metre distance. The use of aluminium for the cylinder body also ensures that, at an all-up weight of just 12.5kg, the new TOTAL portable is lighter than conventional Class B extinguishers.

Boosting joinery shop safety

A new TOTAL portable extinguisher specifically designed to fight sawdust fires in joinery shops, furniture manufacturing plants and timber processing facilities has also been introduced. It

has a special spray nozzle that delivers the correct drop size and flow intensity to fight sawdust fires, and uses a newly formulated water-based agent. This particular fire safety solution should interest manufacturers of office and domestic furniture, fitted kitchens and bedrooms, and chipboard and fibreboard producers.

It has a special spray nozzle that delivers the correct drop size and flow intensity to fight sawdust fires, and uses a newly formulated water-based agent.

Smouldering sawdust fires respond well to water, but conventional Class A water extinguishers lack the ability to deliver the water correctly, and water alone is not always the most effective agent. So, the new TOTAL portable uses Tyco's new fast knock-down TOTALON A water-based agent. This is released when a CO_2 container within the cylinder is activated. Two models are currently available: a 6-litre portable and a 9-litre portable.

New kitchen fire portable

The new cooking oil and fat portable fire extinguisher may well be a major step forward in fire safety in restaurant, hotel and canteen kitchens, fast food outlets and food processing operations. Specifically designed to fight these types of fire that can erupt into flames in an instant, the new TOTAL portable also represents a significant improvement in user safety when compared with conventional portable extinguishers.

A unique feature of the new 6-litre portable is its ingenious nozzle applicator that enables the user to apply the wet chemical agent while safely remaining three or four metres away from the fire. Propelled by nitrogen, the special Tyco-developed agent is effective on all Class F fires that involve cooking oils and fats; it is equally efficient on Class A fires involving flammable solid materials often found in kitchens such as wood, paper and cloth.

Polar liquid fire portable

Conventional foam extinguishers are ineffective on polar liquid fires that are prone to occur in cosmetic, pharmaceutical, and adhesive production environments, and in distilling industries. Manufacturers of household, commercial and industrial cleaning products and disinfectants face similar polar fire threats. The new TOTAL portable solves this particular firefighting challenge by the use of a specially-formulated foam agent developed by Tyco, and the incorporation of a nozzle designed to deliver the optimum foam density.

It also has a major environmental "plus", as the foam concentrate is completely encapsulated within a cartridge inside the extinguisher.

The new 6-litre portable is effective on a whole raft of polar liquids including alcohol, methanol, acetone, propanol and ethanol. It also has a major environmental "plus", as the foam concentrate is completely encapsulated within a cartridge inside the extinguisher. This maximises the life of the foam concentrate and allows the cartridge to be environmentally-friendly recycled. The cylinder is pressurised only when in use and the foam is propelled by CO_2.

New tandem portables

Perhaps one of the most ingenious, not to mention useful, recent developments is the introduction of TOTAL "Tandem" or dual purpose portables. These are portable extinguishers in the conventional sense, which double as fixed, automatic extinguishers that provide around-the-clock protection for special hazards in the workplace. Typically, applications include waste containers, small storage areas, engine compartments, heating systems, small offices and workshops.

When used as a portable, these extinguishers are operated in the usual manner. However when these wall-mounted extinguishers are used in automatic mode, the agent flow is activated by a special 68°C sprinkler sensor to provide protection for a designated area of between four metres and six metres, depending on the height at which the extinguisher is positioned. These Tandem portables are currently available as permanent-pressure foam or dry powder extinguishers for Class A and Class B fires.

The new TOTAL portable extinguishers are available in the UK exclusively through Express Fire in Manchester and CheckFire in Cardiff, and from a country-wide network of approved TOTAL supply partners that are trained to advise, install and maintain the right extinguishers in peak condition. IFP

Further information is available from:
Express Fire on 0161 688 5050, **CheckFire** on 029 2086 8333, or from **Tyco Fire and Security** on 01493 417600

Assuring Surviva Rated Cable

By Kenneth L. Gentile, P.E

Circuits capable of surviving attack from fire are an important consideration when determining operational and regulatory requirements for electrical power and communication systems. While several methods (chases, enclosures, concrete encasement, etc.) are allowed when protecting circuits, this article will explore the use of rated cable assemblies to assure survivability.

Where 1-hour and 2-hour rated cables and assemblies (for expediency the term "rated cables" will apply to all the 1-hour and 2-hour rated cables) are needed but not specified concisely. Costly delays may result from addressing omitted or non-compliant non-rated cable installations. Design engineers, project managers and installing contractors all must be familiar with the types, locations, methods, and inspections necessary for installations of the rated cables on their project.

Familiarity begins by examining the various rated cables and assemblies that are commonly used in the built environment*. Various listings or certifications have been developed to meet requirements of the "application" based sections of installation codes such as NFPA 72, the National Fire Alarm Code; and NFPA 70 The National Electrical Code (NEC). All references in this treatment shall refer to the 2007 edition of NFPA 72 and the 2004 edition of the NEC.

To obtain these listings or certifications, the rated cables must exhibit performance compliant with the listing agency or military specifications. Describing the methods and motivations of these the tests provides valuable insight into the benefits of using rated cables in both required and non-required applications. Identifying the various rated cables is best accomplished by a review of diagrams and descriptions of the physical construction provided by rated cable manufacturers. The labeling, connectors and fittings necessary to determine compliant installation is also diagrammed and described.

Finally, several sections of installation codes and examples that require specific circuits to be 1-hour or 2-hour rated will be presented. Integrating these last examples with the previous discussions of listing classifications, testing methods, physical construction, and identification should provide a thorough, though not complete, understanding of 2-hour rated cables and assemblies.

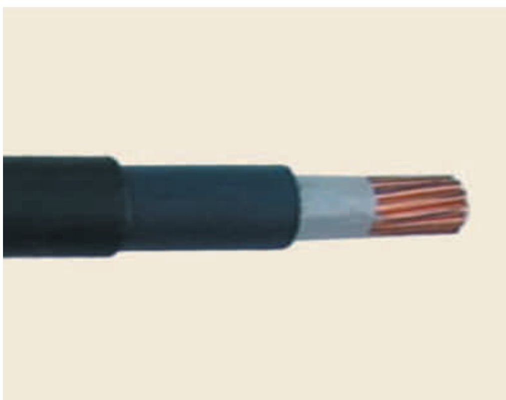

Figure 1. 2-hour Rated RHH Cable. Pic courtesy of TycoControls.

Cable types and the national electrical code

The "Special Equipment" and "Special Conditions" articles in the NEC typically either mandate 1-hour ratings or reference the fire alarm code survivability requirements for select circuits (Articles 695, 700, and 760). To address this requirement, manufacturers have developed several wiring and cable materials that are listed with a 2-hour rated performance. Wiring and cable materials referenced in The National Electrical Code (NEC) that are provided with a 2-hour survivability rating, and are commonly used in construction applications are:

- Power conductors type RHH with ceramifiable insulation (Article 310 and the tables)
- Metal Clad or Metal Clad, Mineral Insulated (Type MC – Article 330/Type MI – Article 332)
- Fire alarm cables FPL(R) and NPLF(R) (Article 760)

Special note should be taken that not all RHH, MC, FPL, NPLF cables are listed for fire survivability. Only those cables specifically listed to U.L. 2196 or an equivalent standard will provide protection against flame attack. Type FPL and NPLF cables will also bear the NEC designation of "CI" or "CIC" if listed for fire survivability. Characteristics of the Circuit Integrity (CI) and Circuit Integrity Conduit (CIC) cables will be further described when listings are discussed.

Only those cables specifically listed to U.L. 2196 or an equivalent standard will provide protection against flame attack.

*Cables used for thermo-coupling applications also maintain a 2-hour rating but as these types of cables are not common to building installations they are not addressed in this article.

ble Circuits with

Typically type RHH and MC cables are used for power applications for fire pumps (Article 695) and emergency systems (Article 700). Type MC Cable is often selected for use where rated cables are need in cable tray applications. Type FPL and NPLF are commonly used to meet fire alarm survivability requirements with MC/MI cables also used for some special fire alarm or power applications, usually in classified locations or where intrinsically-safe circuits are required.

Cable construction and testing

Flame survivability is accomplished by three distinct methods of cable construction. The first method is typical of rated cables for power circuit applications. These rated cables have a ceramifiable insulation enclosed by its usual moisture-resistant thermoplastic insulation (RHH) or metal clad sheath (MC). When the ceramifiable materials are exposed to excessive heat, the insulation changes from a pliable state to a ceramic state in a process that can be likened to firing clayware in a kiln.

Metal clad/mineral insulated cable assemblies have a solid, heat-resistant mineral insulation surrounding the copper conductor and enclosed by a metal sheath.

Rated cables with ceramifiable materials do not require special fittings or connectors other than that the insulation type makes the overall cable size larger the typical RHH or MC cables and must be installed in conduit. Conduit, raceway and metal clad fittings must then be sized accordingly.

Metal clad/mineral insulated cable assemblies have a solid, heat-resistant mineral insulation surrounding the copper conductor and enclosed by a metal sheath (Figure 2). As a result, brass fittings and the manufacturer's specified epoxy or resin must be used to terminate the conductors.

The CI and CIC cables have a high-heat resistant insulation enclosed by the usual FPL or NPLF insulation (Figure 3). This insulation becomes "ash-like" to protect the conductor when exposed to high heat. Some type CI cables may be installed in conduits as well as not in conduit depending upon the specific listing; while CIC cables can only be used where installed in conduit. Otherwise, the listings of the respective cables are no longer valid. In all other aspects, the CI and CIC cables must comply with the listing applications of the suffix for FPL and NPLF and can be either shielded or unshielded. If the cables are to be used as riser cables, the "R" suffix and listing must be present. To install CI cables in plenums, conductors with the "P" suffix and plenum-rated listing must be used.

Figure 2. PVC Jacketed Metal clad/Mineral insulated Cable.

Applicable codes and examples

As previously mentioned, the NEC and National Fire Alarm Code are the source of the most often cited mandatory requirements for survivable circuits. Incorporated by reference by the adopted building codes throughout the United States and many other locations, the circuit survivability requirements of the these two codes must be accommodated where applicable. As mentioned initially, the requirements for circuit survivability in the codes may be addressed by means other than the use of rated cables. The discussion and examples that follow, therefore, will assume that rated cables are the select protection method.

The NEC and National Fire Alarm Code are the source of the most often cited mandatory requirements for survivable circuits.

Survivability requirements for those power circuits not associated with the fire alarm system, are specified for Fire Pumps (NEC 695.6.B) and for the feeder circuits of legally mandated emergency systems in assembly occupancies of more than 999 persons, and most high-rise buildings (NEC 700.9.D).

Note that the rated cables would not be necessary where:

- Feeder circuits are encased in 2-inches of concrete.
- Fire pump feeder circuits originate in the same room as the fire pump.

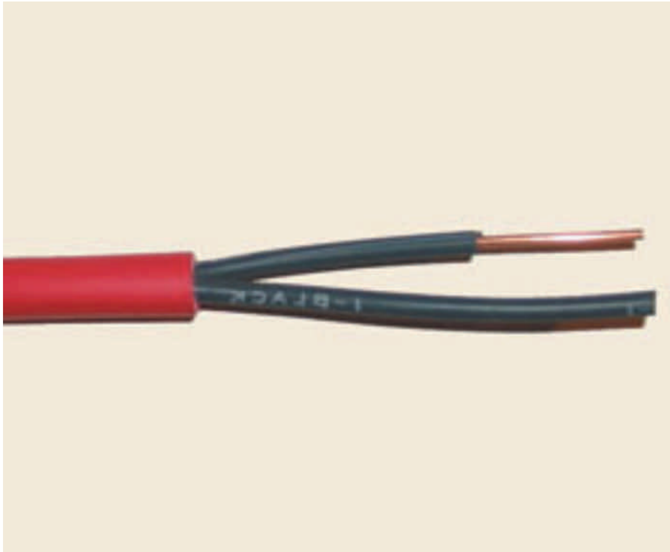

Figure 3. 2-hour Rated FPL-CI Cable. Pic courtesy of TycoControls.

- Feeder circuits serve legally required stand-by electrical systems of Article 701.
- The entire circuit is installed, compliant with NEC methods, in areas protected by automatic sprinklers.

These and other methods mean that in many facilities, the effort and expense associated with rated cables for power circuits can be avoided by proper coordination in the facility design.

Consider, for example, installation of a fire pump in a room remote from the main electrical switchgear. If the feeder can be encased in decking or below floor slabs, adequate survivability from fire is achieved. If the pump is retro-fit, however, in an unsprinklered existing building, rated cables may be the preferred option.

In many facilities, the effort and expense associated with rated cables for power circuits can be avoided by proper coordination in the facility design.

Requirements for fire alarm circuit survivability are found in NFPA 72, the National Fire Alarm Code and often it's provisions have been misapplied. To determine which circuits require protection, the first prescription is found in the Protected Premises requirements (Chapter 6):

> **6.9.10.4.1*** Fire alarm systems used for partial evacuation and relocation shall be designed and installed such that attack by fire within an evacuation signaling zone shall not impair control and operation of the notification appliances outside the evacuation signaling zone. Performance features provided to ensure survivability shall be described and technical justification provided in the documentation submitted to the authority having jurisdiction with the evaluation required in 6.4.3.1.

The first sentence of this paragraph is the prerequisite for survivability. Only systems that have "partial evacuation" or in other words; buildings where the activation of horns, speakers or strobes is limited to segmented areas; are required to provide survivable circuits. Common examples of these types of buildings include health care facilities that often have separate evacuation zones and high-rise buildings with "floor of, floor above, and floor below" or similar evacuation schemes. Since most fire alarm systems activate a "general alarm" throughout the building, 2-hour rated protection for circuits is not required.

Where rated cables (or equivalent, compliant measures) are required, the conductors that require protection are:

> **6.9.10.4.2** All circuits necessary for the operation of the notification appliances shall be protected until they enter the evacuation signaling zone that they serve….

The "All" in **6.9.10.4.2** includes initiating device circuits, signaling line circuits for addressable initiating devices, and notification appliance circuits for all equipment in the evacuation zone. This paragraph also clearly limits survivability requirements to outside of the zone. Circuits installed completely within their evacuation zone, or those portions of the circuits that are located within their evacuation zone are not subject to survivability requirements. Finally, power circuits for remote power supplies located outside of the evacuation zone must also be protected (**4.4.1.9.3.1(B)**).

The other requirement for survivable fire alarm circuits is found in **6.10.1.16.** New to the code to assist responders, survivability must be incorporated for *"All circuits necessary for the operation of two-way telephone communication systems"*. All fire-fighter telephone circuits, replacement fire alarm systems, must now be protected.

To better understand the application of these requirements, consider a high-rise building with "floor of, floor above, and floor below" occupant notification (Figure 4). Since each floor is its own evacuation zone, it is wired with dedicated notification appliance circuits that only serve a single floor. These circuits need only be survivable from the panel to the riser and up the length of the riser itself.

New to the code to assist responders, survivability must be incorporated for "All circuits necessary for the operation of two-way telephone communication systems".

A signaling line circuit, that serves initiating devices on multiple floors would need to be protected at any location that would prevent alarm operation of any other evacuation zone

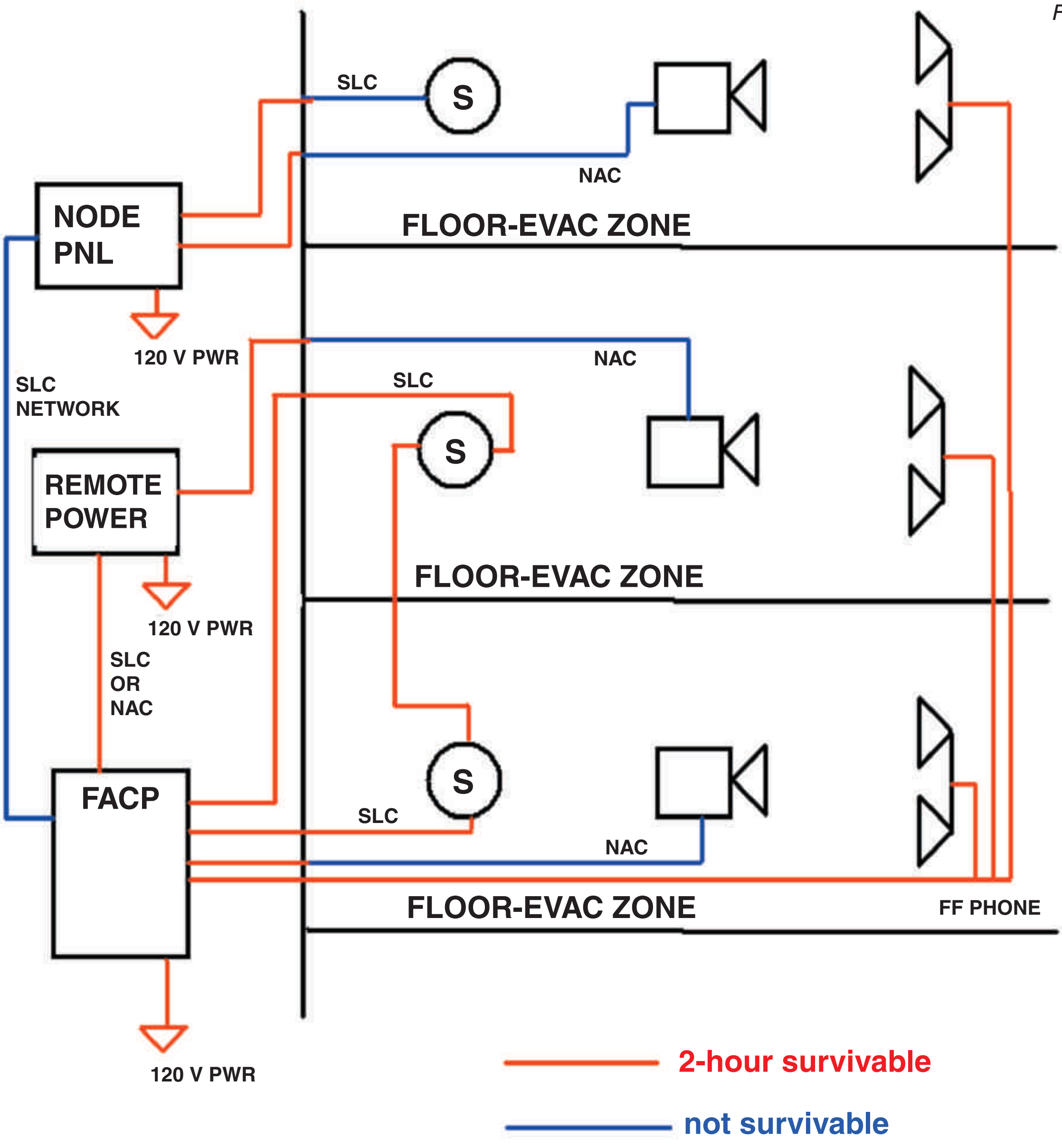

Figure 4

notification appliances. Remote power extenders for strobes or similar remote equipment, would require protection of their power line circuits. Signaling line network circuits between panel nodes would not require protection if the panel nodes are capable of local operation when isolated from the network.

The 2007 edition of the National Fire Alarm Code provides for numerous options for meeting the circuit survivability requirements. Though this article has dealt with rated cable assemblies, design professionals should be aware of all the possible methods. These are listed as:

1 A 2-hour fire rated circuit integrity (CI) cable
2 A 2-hour fire rated cable system (electrical circuit protective system)
3 A 2-hour fire rated enclosure
4* Performance alternatives approved by the authority having jurisdiction
5 Buildings fully protected by an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and with the interconnecting wiring or cables used for the operation of notification appliances installed in metal raceways and in accordance with Article 760 of NFPA 70

Option "(1)" is new to the 2007 edition as type "CI" cable is new cable type recognized in for the first time in the 2004 National Electrical Code (NFPA 70) and option "(5)" has been elevated in status from its previous place in the 2002 code as an "exception" to other methods.

Conclusion

As has been presented, the survivability of circuits from attack by fire is maturing. Development of the products available as 2-hour rated cables and assemblies are improving performance of such rated cables. New options in the codes prescribing survivability, such as installation of fire alarm circuits in conduits where the building is sprinklered, permit design professionals leeway in design development and code compliance. All that remains is for engineers, architects, project managers, and installers to maintain an awareness of where and how circuit survivability must be maintained. IFP

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Approved Docum from the ASFP!

In December 2006 the Government department 'Communities and Local Government' announced revisions to Part B (Fire safety) of the Building Regulations and the guidance in Approved Document B. In comparison to previous editions Approved Document B has been split into two parts namely, Volume 1: Dwellinghouses and Volume 2: Buildings other than dwellinghouses

By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)

These changes will affect future building work in England and Wales and come into force on 6 April 2007. The building work covered includes the erection, extension or material alteration of a building and how fire safety is designed into a building. They also include amendments to the guidance on domestic loft conversions, the use of door-closing devices in dwellings and the provision of sprinklers in tall blocks of flats.

The key changes for non-domestic buildings include the introduction of a maximum unsprinklered compartment size for single storey warehouses, new guidance on residential care homes (including on the use of sprinklers) and a new requirement to ensure occupiers are made aware of their building's fire protection measures, so as to assist with the preparation of fire risk assessments under the new Regulatory Reform (Fire Safety) Order regime. This latter requirement is to be found in a new Appendix G, which provides guidance on the new requirement for fire safety information to be recorded and passed on to the 'responsible' person. In the words of the document:

'Fire safety information means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety.'

New guidance is also given on the need to ensure that management regimes of premises with regard to fire are realistic.

The Association for Specialist Fire Protection (ASFP) was heartened to see that third party certification schemes are given greater prominence in the new documents and that, if acceptable, such schemes may be accepted by Building Control Bodies as evidence of compliance. In the opinion

New guidance is also given on the need to ensure that management regimes of premises with regard to fire are realistic.

of the ASFP third party certification schemes should be accredited to the United Kingdom Accreditation Service (UKAS).

It has to be remembered that Approved Document B is purely guidance and other ways of complying with Building Regulations are possible. That said, Volume 2 refers to the follow documents:

- HTM 05 "Firecode" should be used for used for the design of hospitals and similar health care premises

ent B – welcome

- BB100 should be used for the design of schools.

The ASFP has long been concerned that many designers concentrate more on the structural stability of a building in a fire, than on the integrity of its compartmentation. The new documents address this concern by asking that the predicted deflection of a floor, in the event of a fire, should be accommodated in the design of compartment walls.

It has to be remembered that Approved Document B is purely guidance and other ways of complying with Building Regulations are possible.

Documents from the ASFP are referred to in the new Approved Document B and these include:

- 'Fire Protection for Structural Steel in Buildings' (also known as the 'Yellow Book')
- 'Fire Stopping and Penetrations Seals for the Construction Industry' (aka the 'Red book')
- 'Fire and Smoke Resisting Dampers' (aka the 'Grey Book')
- 'Fire Resisting Ductwork' (aka the 'Blue Book').

As well as the above, a collaborative document from all of the UK's passive fire protection industry (including the ASFP) namely, 'Ensuring Best Practice for Passive Fire Protection in Buildings' is also referred to in the new Approved Document B.

The benefits are quite substantial with lives saved and injuries prevented respectively being 43-45 and 1,555-1,575 respectively over a 25-year period.

The changes to Approved Document B are estimated to cost approximately £8.7-£11.1m per year, most of which would be in the non-domestic sector (£7.0-£9.4m). In addition, there is also a one-off cost of around £4m to cover training and familiarisation of the industry.

In comparison, the benefits are quite substantial with lives saved and injuries prevented respectively being 43-45 and 1,555-1,575 respectively over a 25-year period. This is estimated to provide an annual benefit of £4.8-£5.0m. In addition, there are also annual savings of £3.8-£4.8m per year due to reduced property damage from fire and an annual cost saving of £8.2m from removal of the guidance on the provision of door closers. The vast majority of these benefits would be in dwellings.

In the words of Communities and Local Government, *'It should be noted that the benefits in terms of lives saved and injuries prevented are cumulative, i.e. the benefits for the properties built in year 1 are experienced again in year 2, together with those for the properties built in year 2, in year 3 the benefits are experienced for properties built in each of the three year etc and continue to accrue in this way over the lifetime of the buildings. However, other than a small element of routine maintenance associated with some measures (e.g. sprinklers), the costs and/or savings associated with building the properties in accordance with the revised guidance in Option 3 (the one chosen) are only experienced when the properties are built. Cost-benefit analysis has shown that, the measures become increasingly cost-effective in the longer term (over 50 years).'*

The ASFP welcomes this new fire documentation and looks forward to working with all in the fire community to drive through the benefits that are associated with it. IFP

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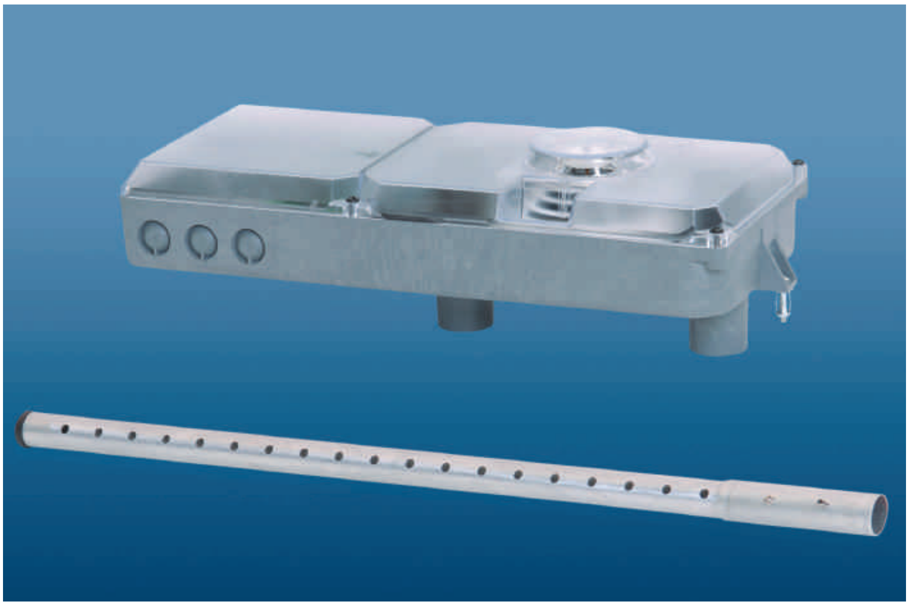
Easy integration into Bosch's Local Security Network

The 'intelligent' air duct smoke detector

- External mounting allows convenient maintenance and status visibility
- Three different tube lengths ensure optimal capture of smoke particles



BOSCH SECURITY SYSTEMS has added an air duct model to its wide range of intelligent fire detectors. The new detector provides early warning of the presence of smoke in a building's heating, air conditioning or ventilation ducts. Such detection helps to prevent injury, panic and property or equipment damage by reducing the circulation of smoke resulting from a fire elsewhere in the building. The air duct smoke detector integrates the same, proven optical performance characteristics for smoke detection as Bosch´s Magis.Sens Series. The new detectors can be used together with other ceiling-mounted, special detectors and selected fire panels to provide a total and efficient fire detection and alarm system.

Key features of the air duct smoke detector include drift compensation in optical measurement, excellent detection speed and precision, continuous 'intelligent' analysis of sensor signals and a high level of security against false alarms. Easily mounted on the outer surface of a duct casing, the new detector's status is always visible and it is conveniently accessible for maintenance. Three tubes – 46 cm, 91 cm and 152 cm – are available, where two of them can be interconnected to match different diameters of duct channels.

As with various other Bosch models, the new air duct detector can be easily integrated into Bosch's Local Security Network (LSN) bus system. LSN is a freely configurable security bus system that offers a wide choice of fire, intrusion and malfunction detectors, operator units and aiming devices from multiple manufacturers. It also allows automatic component identification, address assignment support and functional security in the event of cable interruption or short circuit.

The air duct smoke detector is designed for use with Bosch's 500 and 2000 Series Fire Panels and the 5000 Series Modular Fire Panel. An optional relay board is also available for controlling third-party equipment, such as ventilation flaps.

See www.boschsecurity.com for further information.

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Rockwool TCB Cavity Barrier

ROCKWOOL INSULATION, the leading manufacturer of stone wool insulation for thermal, fire and acoustic insulation, has further extended the scope of application of its FirePro TCB Cavity Barrier range which is designed to reduce the risk of fire spread in timber framed constructions.

Timber framed buildings are increasing in popularity in the UK, due largely as a result of an increase in demand for sustainable construction methods. However, as the Beaufort Park fire dramatically illustrated, fire can always be a threat in completed buildings as well as those under construction.

Rockwool TCBs have now also been fire tested and assessed for use between timber structures, for example between timber frame party floor joists and timber studs at external cavity wall/party wall 'T' junctions. Rockwool TCBs achieve up to 60 minutes integrity and insulation following fire performance tests carried out by Warrington Fire Research Centre.

Made from Rockwool stone wool and encapsulated in a translucent red polythene sleeve, Rockwool TCBs, tightly butt jointed, ensure a continuous fire seal. Traditionally, Rockwool TCBs have been tested and assessed to BS 476: Part 20 for use in concealed cavities consisting of masonry-to-timber and masonry-to-masonry faces (WFRC Report 133269). However, the range has now been tested and assessed for use within timber-to-timber cavities (WFRC Report 160657).

Vanessa Hatton, Marketing Services Manager at Rockwool, said: "Rockwool is committed to the ongoing development of solutions for the construction industry which are tested and certified at the highest levels. The testing and certification of our TCB Cavity Barrier Range to guarantee its suitability for timber frame constructions illustrates our support of sustainable construction and our recognition that timber frame will continue to be a growing market for Rockwool."

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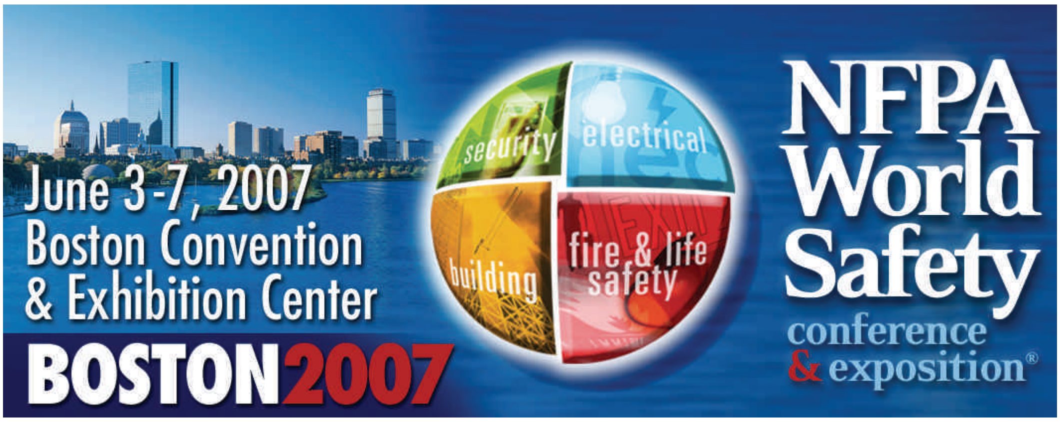

More than 4,000 fire and life safety, electrical, and security professionals will convene in Boston the first week of June for the 2007 NFPA World Safety Conference & Exposition® (WSC&E). This incomparable educational event offers vital code updates, solutions to the challenges you face on the job, and a chance to network with other professionals who care about doing things right.

The Education Conference

This year's conference will feature more than 150 education sessions within 11 conference tracks. New for 2007 will be a special track on Fire Protection Engineering sponsored by the Society of Fire Protection Engineers (SFPE). As the 2008 edition of the National Electrical Code® will be voted on during this meeting, the necforum™ track will offer more than 15 sessions. The *necforum* considers new electrical design issues, successful maintenance programs, best practices in electrical contracting, effective inspection techniques, and practical electrical safety programs. Rounding out the conference tracks are:

- **Building and Life Safety** – Concentrates on practical information such as plans review, inspection techniques, updates on code requirements, new technologies, and best practices.
- **Codes and Standards** – Includes information on the reasons behind important code changes and how they will be implemented.
- **Detection and Suppression** – Focuses on code requirements and design issues, the application of new technologies in alarm and suppression systems, and the impact of maintenance on systems performance.
- **Disaster Preparedness/Business Continuity** – Includes information on assessing risks and consequences, emergency preparedness, contingency planning, incident management, and recovery plans.
- **Fire and Emergency Response** – Includes current information on fire-fighting apparatus and technologies, safety and preparedness for first responders, incident command strategies, and fire prevention and inspection techniques.
- **Industrial Fire Safety and Security** – Emphasizes new technology in industrial fire protection and emergency response, fuel storage issues, and security of industrial processes.
- **Premises Security** – Examines issues related to creating and implementing security plans, as well as designing, installing, and maintaining security systems.
- **Public Education** – Includes fire and life safety planning and strategies. Also offers the latest in safety education including challenges and creative solutions.
- **Research** – Considers the latest information available on many timely issues, such as video smoke and flame detection systems and reliability of water mist fire protection systems.

Featured Presentation and Spotlight Sessions

A number of sessions at this year's conference will focus on high profile fires with a regional connection to Boston. The featured presentation on Tuesday, June 5, will be a panel discussion surrounding the 2003 Station Night Club Fire in West Warwick, RI. This session will present the findings of the fire investigations conducted by NFPA and NIST. Another high profile fire, Boston's Cocoanut Grove fire, will be covered in one of the six spotlight sessions following the featured presentation. This fire which killed 492 people changed fire code enforcement, burn treatment methods, and manslaughter case law around the nation. Experts will examine this historic fire from multiple angles, including the lasting impact it has had on Boston. Other spotlight sessions include Questions on the WTC Investigations; Changes to NFPA 25; Mass Notification – Where Is It Heading; Electrical Safety, OSHA, and NFPA 70E; and Using Risk Concepts in Codes and Standards Development.

Special Presentation

On Sunday, June 3, David McCullough, historian and renowned author of such best selling books

as *John Adams*, and *1776* will deliver a special presentation during the general session. Mr. McCullough has been widely acclaimed as a "master of the art of narrative history," His books have been praised for their scholarship, their understanding of American life, their "vibrant prose," and insight into individual character. Mr. McCullough's presentation entitled *Leadership and the History You Don't Know* will be followed by a book signing in the exposition hall.

The Exposition

The three-day product exposition will showcase many of the latest technologies and services from more than 300 of the top solution providers in the fire and life safety, electrical, and security industries. Knowledgeable representatives from these companies will be available to answer your questions and offer solutions to your most pressing challenges. This year's exposition gets off to a great start with the Grand Opening Kick-Off Reception sponsored by Underwriters Laboratories. Join thousands of your peers in the exposition hall for refreshments and meaningful conversations. As always the exposition is free when you register in advance, or bring a completed registration form with you to the show.

Pre-Conference Seminars

The *2007 NFPA World Safety Conference & Exposition* may officially begin on June 3rd, but for many people, the lure of NFPA's pre-conference seminars is hard to ignore. This year NFPA is offering 22 pre-conference seminars on Friday and Saturday, June 1-2. These seminars are priced separately from the main conference and are offered at a substantial discount from NFPA's regular seminar pricing.

- 1-Day Seminars on Friday, June 1
  - Campus Fire Safety
  - Changes to NFPA 72®: National Fire Alarm Code® – 2007
  - Emergency and Standby Power Sources and Requirements
  - NEC® Changes
  - NFPA 99: Health Care Facilities
- **2-Day Seminars on Friday and Saturday, June 1-2**
  - CFPS Primer
  - Life Safety Code® Advanced Problem Solving
  - Life Safety Code® Plans Review
  - NFPA 1, Uniform Fire Code™
  - NFPA 70E™: Electrical Safety in the Workplace™
  - NFPA 921: Fire and Explosion Investigations
  - NFPA 1600: Disaster/Emergency Management and Business Continuity Programs
  - Sprinkler Hydraulics
- **1-Day Seminars on Saturday, June 2**
  - Changes to NFPA 13: Installation of Sprinkler Systems – 2007
  - Electrical Inspection for the Safety Practitioner
  - Explosion Prevention and Protection
  - Fire Protection in Food Service Facilities
  - Hydrogen Technologies Safety
  - Introduction to NFPA 30: Flammable and Combustible Liquids Code – 2008
  - Life Safety Code® for Health Care
  - NEC® Changes

The Technical Committee Report Sessions

At the heart of the codes and standards development process are the technical committee report sessions. More than 25 documents are up for review this June including the National Electrical Code®, the most widely adopted code in the nation, and NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. Other documents covering areas such as aircraft and airport facilities, rescue and fire fighting, fire tests, forest and rural fire protection, hazardous materials response personnel, pyrotechnics and more will all be voted on during these sessions. Don't miss this opportunity to see the code making process in action.

The City of Boston

When you come to Boston, if all you see is the airport, your hotel, and the convention center, you'll miss out on a *wicked* good time. Take in the sights and sounds of bustling Faneuil Hall Marketplace with its hundreds of shops, vendor carts, restaurants, and entertaining street performers. Catch a Red Sox game, or take a tour of venerable Fenway Park. Walk the Freedom Trail and visit numerous historic sites including Paul Revere's house and the Granary Burying Ground. Boston is more than just clam *chowdah* and baked beans with hundreds of dining options to please every palette. Come to the 2007 NFPA World Safety Conference & Exposition for an incomparable learning experience, and be sure to explore all that Boston has to offer. IFP

For more information contact:
www.nfpa.org

Klaxon to Launch New Products at Fire Expo 2007

KLAXON SIGNALS, one of the world's leading manufacturers of audible and visual signalling equipment, has repositioned itself as a key supplier in the fire market through the development of innovative new products.

At the 2007 Fire Expo, Klaxon will be launching base sounder beacons, voice sounders, enhanced deep base variants and a door retainer range.

Base sounder beacons, for use with fire detectors, are fire alarms with a unique LED design that can be seen from every angle including directly below the unit. Twelve high powered LEDs function with a 95 dB sounder for both audio and visual warning that complies with the Disability and Discrimination Act.

Klaxon Signals have re-engineered its existing Sonos fire alarm range to produce enhanced deep base variants that can accommodate a variety of protocol chips such as heaters and relays. This added feature provides end-users with the option of creating a user specific fire safety system.

Sonos and Nexus voice sounders benefit from all the functionality and features of existing Sonos and Nexus technology with the added versatility of user-specific recordable warning messages.

Klaxon Signals will also be showcasing its existing Sonos and Nexus range of sounders, beacons and sounder-beacons at this year's show.

The Nexus range of fire alarms are manufactured specifically for industrial, fire and marine applications. Features include weatherproofing to IP66, and a range of high outputs to overcome most levels of background noise.

The Sonos range of fire alarms employ 'first fix' technology that ensures faster installation and maintenance. All models are CPD, LPCD, VdS and NF approved to meet standards in the global market.

Klaxon Signals Limited is one of the world's leading manufacturers and suppliers of sound and vision signalling equipment for fire and life safety, industrial and security applications. Part of Halma p.l.c., Klaxon offers an extensive range of fire alarm sirens, electronic sounders, buzzers, beacons and bells, in addition to innovative evacuation technology and software.

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New Sales Representative Joins Reliable Automatic Sprinkler Team

The RELIABLE AUTOMATIC SPRINKLER COMPANY is pleased to introduce **Scott Chafin** as their Southeast Regional Sales Representative.

Scott is a 24-year veteran of the fire protection industry. He began in 1978 working for Security Fire Protection Co., Inc. in Memphis, TN. His years took him from the fabrication department, to field operations, to the engineering department, to sales, and finally to Vice President from 1997 to 2003.

He is a graduate of the University of Kentucky where he was a member of the management staff of the basketball team from 1981 to 1984. While attending the University of Kentucky, he worked as a sales representative for Security Fire Protection targeting the central Kentucky territory.

Scott is married to his high school sweetheart, Patty, and they just celebrated their 20th wedding anniversary this past year. They have two sons, Logan & Corey, 17 and 13 years of age.

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The Reliable Automatic Sprinkler Co., Inc.
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Fax: +1 (914) 829-2141
Website: www.reliablesprinkler.com

ALSECURE NX200 fire-resistant cables meet the latest emergency lighting standards

The ALSECURE NX200 range of fire-resistant building cables from Nexans, the worldwide leader in the cable industry, has just passed its 60-minute fire test to ensure compliance with the new PH60 requirement of BS5266-1 for emergency lighting. This new compliance enables the ALSECURE NX200 range to provide a versatile 'one-stop-solution' for, fully certified, easy to handle and install cables for a range of building safety systems including fire detection, emergency lighting, voice alarm, public address and smoke evacuation.

Nexans has developed the ALSECURE NX 200 cable range to ensure continued operation of vital safety systems for the critical evacuation and fire-fighting periods required by the highest UK standards (with BASEC and LPCB type approvals). In addition to meeting the new PH60 requirement of BS5266-1, ALSECURE NX200 is suitable for use on all properties where an evacuation period is required (in compliance with BS5839-8434 part 1, PH30).

In addition to meeting extreme fire conditions for extended periods, the ALSECURE NX200 cables are flame retardant and release minimal smoke in case of fire.

Easy to install and handle

Nexans has paid particular attention to making the NX200 cables easy to install. There are no extra tapes to remove, they are easy to strip and they retain their memory. They are supplied on easy carry colour-coded reusable plastic reels – with a unique pop-up handle. For fast and easy roll-outs the reels can also be used in conjunction with Nexans own rolling device system.

Complete range

The ALSECURE NX200 range offers a wide choice of core count and conductor sizes for use with AC and DC voltages of 300/500V. It forms part of a developing range that also includes single-core and armoured cables as well as fire-reaction cables, and is backed-up by Nexans' full uk technical and logistical support.

More information available on www.nexans.com

Optical Beam Smoke Detection

FIRE FIGHTING ENTERPRISES

Optical beam smoke detectors account for a relatively small number of the commercial grade fire detectors sold across the world. Most fire protection systems use compact "point" (or "spot") detectors, and these are well suited to the enclosed rooms, hallways and staircases that make up the majority of commercial premises. However, where fire protection is required for large open areas, beam detectors have established themselves as a more economical alternative. Moreover, in certain circumstances they can actually be more effective than point or aspirating devices.

Principle of operation

At its simplest, a beam detector consists of a light source, typically an infrared LED, directed towards a photoelectric sensor. The output current of the sensor varies in proportion to the intensity of light falling on it. Enclosed in suitable housings with adjustable mountings to allow precise alignment, the light source (or transmitter) and sensor (receiver) are installed on opposite walls a short distance below ceiling level. Smoke particles present in the air will obscure the light beam to some degree, causing a measurable drop in current, which can be used to trigger an alarm.

It is important to distinguish this, the *obscuration* principle of detection, from the way in which optical point detectors measure smoke. Although the self-contained point detector comprises the same basic elements of light source and sensor, here the sensor is configured at an angle of up to 90 degrees to the source, not opposite. This arrangement measures not the obscuration of light by smoke particles but its *scattering*; more smoke in the measurement chamber means more light is scattered in the direction of the sensor. For this reason, the large-scale beam detector is sometimes called a linear detector to distinguish it from the point detector with its non-linear light path.

Cost savings

Beam detectors are, by nature, suited to the protection of wide areas. They can be used in most buildings containing open spaces and high ceilings, with typical applications including hotel atria, shopping malls, churches, warehouses and sports halls. While specifications vary from one manufacturer to another, the maximum distance that can be covered by a single beam detector (that is, one transmitter and one receiver) is generally around 100 m. At this distance, the area protected can be 1500 m^2 or more. To cover the same area with point detectors – assuming that the ceiling is not so high as to make their use inappropriate – would require perhaps fifteen devices.

This will almost certainly mean a cost saving in terms of detector hardware, as the purchase price of a beam detector is comparable on average to that of ten point detectors. However, with cabling needed for just two devices instead of fifteen, the savings in terms of installation time and cost can be even more significant. In addition, the process of commissioning a new detection system becomes simpler because there are fewer devices to test.

Once installed, beam detectors continue to represent good value because with fewer detectors in a given area, maintenance and servicing will be easier and quicker. This is especially true where ceiling level can only be reached with the aid of hydraulic platforms or scaffolding towers; clearly, as this sort of equipment is disruptive as well as costly, most commercial premises will want to keep its use to a minimum.

The wall-mounted position of beam detectors – in contrast with point detectors, which must be positioned away from the walls – can also help to make access easier. In a warehouse, for example, where stored goods and plant at floor level may make it difficult to position climbing or lifting gear beneath point detectors, the peripheral location of a beam detector can usually be reached without difficulty using a ladder.

Keeping a low profile

Beam smoke detectors are not the sole preserve of warehouses and other commercial premises where low installation and maintenance costs make them attractive to specifiers. In historical churches, stately homes, castles and similar large-roomed "heritage" buildings, mounting a small number of devices on the walls is preferable to laying extensive cabling behind a fragile, intricately detailed ceiling. Indeed, in cases of particular architectural significance it may be essential.

Of course, a number of manufacturers produce point-type fire detectors that communicate with control equipment using radio signals in order to minimise cabling requirements in buildings of this sort. However, these may not be suitable for every project. Not only are they apt to be expensive when compared with beam detectors; they must also be installed in the same high numbers as any other point devices, and may as a result be more visually intrusive than beam detectors. Clearly, as long as the highest standards of life and property protection can be maintained, historical buildings should have on display as few modern-looking devices as possible.

Latest Product Developments

Advances in technology have led to the latest developments in Optical beam smoke detector technology. Motorised, automatic aligning beams are now available, which combine the benefits of the "reflective" systems with the ability to be able to compensate for gradual building movement, resulting in even lower maintenance. The more advanced versions even incorporate a LASER to assist with initial alignment. The installation is further simplified by the use of an innovative first-fix system, similar to that used by traditional point detectors.

These latest beam detectors can be fully controlled, tested, and even aligned from the low-level system controller, and can provide a full performance overview via an inventive graphical user interface. The benefit being that the beam detector system can be fully customised to local user requirements. IFP

For more information contact:
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Email: sales@ffeuk.com
Website: www.ffeuk.com

Voice sounders have come of age

It is 7 years now since the first truly low current voice enhanced sounder was launched in the UK. Since that time, voice sounders have become part of fire industry vocabulary.

Fire-Cryer® Plus 7-Message Voice Sounder/Strobe

This article brings us up to date with recent advances in voice sounder development and illustrates how modern voice sounders can assist in enabling even quite basic fire alarm systems to be used as modern, versatile evacuation systems.

Voice Sounders

Often incorrectly referred to as 'voice activated sounders', voice sounders that store pre-recorded messages are simply conventional sounders with the *enhancement* of pre-recorded voice messages.

When considering the use of voice sounders over a more traditional VA (voice alarm system), alarm system design engineers are often surprised to learn that Vimpex's Fire-Cryer® Voice Sounder can actually broadcast four discrete messages on a simple 2-wire radial bell circuit. The Fire-Cryer® is no more complex to install than an electronic sounder or bell.

The use of voice sounders does have many advantages over VA systems in terms of installation and wiring costs. No special training is required to install voice sounders. They are a fully integrated part of the fire alarm system. Voice sounders are unable to broadcast live messages though and some units are limited to the number of pre-recorded messages available.

Great Expectations of Modern Fire Alarm Systems

More and more is now expected of fire alarm systems. Fire panels are becoming increasingly sophisticated and the number of peripheral devices now monitored by fire panels is bewildering. Fire alarm systems have evolved into general evacuation and life safety systems:

Fire Panels nowadays monitor numerous life safety devices:

- Adherence to the DDA (Disability Discrimination Act) now means that fire panels are often monitoring disabled refuges and toilets
- Bomb alerts and panic alarm buttons are often interfaced to the fire system
- Water leakage detection systems are common alongside gas systems
- Gas detection systems are often interfaced
- 'Door closing' alarms are becoming more common

With the increased versatility of fire systems, the challenge for the fire engineer is how to clearly and unambiguously advise the occupants of a building the state of alarm, bomb alert, system test, medial emergency.. the list goes on.

Fire-Cryer® Plus

An argument used by advocates of VA systems over voice sounders is that the existing Fire-Cryer® can only broadcast four discrete messages. Perhaps it is fair to say that the current range does limit itself to the obvious 'Fire Alert' – 'Alarm' – 'Test' – 'All Clear' message strings that are by far the most commonly supplied to Vimpex's customers.

A new product to be launched at International Fire Expo in May will transform the Fire-Cryer® range and prove that voice sounders can be used in even the most sophisticated evacuation systems.

The result of several years of significant investment, the Fire-Cryer® Plus is a combined 7-message voice sounder and strobe. The ability to broadcast such a large number of messages on a conventional 2-wire circuit means that the Fire-Cryer® Plus will prove to even more people that voice sounders are suitable not just for small systems, but also in large office blocks, hospitals and industrial sites.

Control

In order to switch from message to message, a voice message controller (VMC) interface is installed on the bell circuits, either alongside the panel or, as will be the case in many systems, interfaced with an analogue loop. The newly designed VMC makes installation even easier and gives the user full control of message selection. Three monitored inputs are supplied so life-critical bomb alerts, panic buttons or disabled alarms are catered for. The VMC ensures synchronisation of messages over multiple sounder circuits.

Programming

Much of the investment into the Fire-Cryer® Plus range was actually in the design of proprietary software, the 'sequencer', which is used to programme the Fire-Cryer® with customer-defined message strings. With any combination of 7 messages chosen from a library of over 300, the number of possible message combinations is massive. For this reason, the programming and management of the message strings was a very important aspect of the Fire-Cryer® Plus development programme. The same sequencer programme is also used to select which messages are backed up with a flashing beacon.

Versatility

The new Fire-Cryer® Plus is one part of the fully overhauled Fire-Cryer® range which includes:

Maxi Fire-Cryer®	IP66 horn for open spaces and industrial sites
Midi Fire-Cryer®	sturdy unit great for shopping malls and warehouses
Mini Fire-Cryer®	Base mounted sounder for offices and commercial use
Animate®	Animal Friendly sounder

The Future

Voice sounders have come of age. They will never replace the need for full-blown VA systems where live voice broadcasts are a necessary safety measure in large or complex buildings requiring phased evacuation. The Vimpex Fire-Cryer®, however has now reacted to the needs of the market and an increase in the number of messages available means that they offer the installer cost-effective and easily installed way to clearly, visibly and unambiguously signal to the occupants exactly what to do in the case of emergency.

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Website: www.vimpex.co.uk

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7th

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The afternoon of the first day will be used for real fire demonstrations with water mist systems at an institute in Paris. The shuttle bus is already included in the attendance fee

Registration

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Payment received on or before 29 June	Members **390 Euro**	Non-Members **450 Euro**
Payment received after 29 June	Members **430 Euro**	Non-Members **490 Euro**
On-Site Registration	Members **470 Euro**	Non-Members **530 Euro**

☐ Bank transfer ☐ Credit Card* *Payment by credit card available for attendees outside Europe by Paypal

Date________________ Signature __________________________________

Fax or mail this registration form to: **International Water Mist Association**, Biederitzer Str. 5, D-39175 Heyrothsberge, Germany, or register online at **www.iwma.net**

Phone +49 - 392 92 - 690 25 **Fax +49 - 392 92 - 690 26** **E-mail info@iwma.net**

PROFILE

International Fire Expo, 21-24 May 2007

As the UK's largest fire industry event, International Fire Expo will offer visitors the opportunity to meet over 170 leading suppliers. Taking place from 21-24 May 2007 and covering two halls at the NEC, International Fire Expo is the perfect event for those involved in fire prevention and protection to make the best buying decisions and network with the industry's leading companies including Apollo Fire Detectors, C-Tec, Gent by Honeywell, Fulleon, EMS Radio Fire & Security Systems, Hochiki, Siemens, Ventcroft, Klaxon and KAC.

International Fire Expo 2007 will feature a packed seminar programme relevant to all visitors. Presenting tangible benefits for the day-to-day role, these free sessions will provide visitors with an opportunity to network and compare notes with colleagues from the UK and abroad. Topics for this year's seminar programme will range from false alarm reduction to the Regulatory Reform (Fire Safety) Order and from DDA compliance to Third Party Certification.

The Fire Industry Association will be staging a number of short informative papers on applied technology within the fire protection sphere. Divided into two main sessions, detection & alarms and extinguishing, they are designed to attract professionals from within the industry including the fire service and the specifiers & users.

Running from 22-24 May 2007 will be the new Fire & Rescue Exhibition & Conference, which is run on behalf of the Chief Fire Officers' Association (CFOA), The Institution of Fire Engineers (IFE) and The Fire Protection Association (FPA). Catering for the requirements of everyone within the Fire & Rescue Service, the event will focus on the key developments in this sector from changes in legislation through to modernisation.

As well as appealing to high-ranking fire officers, Fire & Rescue will provide all those involved in the operational and procurement aspects of the fire-fighting industry with a platform from which to source a variety of products and services and learn about the latest developments taking place within the industry. The event will offer a multitude of innovative attractions in the way of themed villages, an outdoor demonstration area and educational seminar theatres. Exhibiting companies will include Trelleborg, Lion Apparel, Bristol Uniforms, Interspiro, Cosalt Ballyclare and The Fire Service College.

The CFOA Conference programme for Fire & Rescue 2007 boasts an impressive speaker line up, and includes such well known names as Lord Stevens, former Commissioner of the Metropolitan Police and Lord Bruce-Lockhart, Chairman of the LGA. 2007 will also have a distinctively international feel about it with contributions from the US Department for Homeland Security, Phil Stittleburg, Chairman of the National Volunteer Fire Council (NVFC) and Keith Richter President of the Metropolitan Fire Chiefs Association. Appearing high up the agenda for 2007 will be Equality & Diversity as will be IRMP and the ever growing issues of Charging & Trading and False Alarm Initiatives. In keeping with tradition the conference will be rounded off with the usual lively exchange between Phil Toase, CFOA President and Angela Smith MP, Minister for Fire.

Located outside the halls, the Emergency Action Zone is where the very best in fire fighting and rescue equipment and techniques are put to the test in front of a live grandstand. This outdoor area will allow visitors to witness live demonstrations of the latest products and rescue techniques in action, through a series of choreographed demonstrations courtesy of the West Midlands Fire & Rescue Service. The displays planned for this year will include an urban search and rescue demonstration, a living room fire simulation, vehicle extrication, technical rescue and water rescue.

International Fire Expo and Fire & Rescue will represent the largest gathering of the fire profession ever seen in the UK. Entry to both International Fire Expo and Fire and Rescue 2007 is free. Register in advance at www.internationalfireexpo.co.uk and www.fireandrescueexpo.com, where the latest event information, news and seminar timetables are also available. Companies interested in exhibiting at either exhibition should contact Gerry Dunphy on +44 (0)20 7921 8063 or gdunphy@cmpi.biz.

Please note that all seminar and conference sessions are subject to change. IFP

internationalfireexpo

The invisibility of fire safety in public transport Areas

When developing concepts for the planning of a modern public transport area, architects and designers need to consider a number of requirements, including aesthetics, functionality, and safety issues.

Of course, these must be balanced with cost and budget considerations. The latest trends in design lean toward more transparent building structures that feature the largest possible glazed openings in interior walls (such as partitions in escape routes, floors or façades). And because the glass used in such a structure must prevent the spread of fire into other parts of the building, only the most sophisticated glass products are adapted to such requirements. While this principle applies to all huge public buildings and traffic centres, airports are among the best examples of structures requiring the multi-functional application of special glass products. Especially in terms of safety and fire resistance!

Large glazed areas of fire protection glass can be found in almost every modern airport. Vetrotech Saint-Gobain's most well-known fire resistant glass products, such as SGG CONTRAFLAM, SGG PYROSWISS and SGG SWISSFLAM STRUCTURE, are applied in glazed partitions and fire doors, and have been utilized for construction projects at the Unique Airport Zurich-Switzerland, where partitions were built with SGGPYROSWISS E30 glass, and in the new Hong Kong International Airport, where the roof glazing above shopping areas ensures compartmentisation in the case of a fire.

Vetrotech has recently completed several challenging projects that combine maximum visibility with maximum safety, which proves that such a balance can be achieved. One of these projects was conducted in one of Germany's InterCity Express (ICE) train stations, which happens to be located directly underneath the check-in areas of the Köln-Bonn (Cologne) Airport. Smoke curtains made from 30-minute fire-resistant integrity glass were utilized to help protect airport dwellers from hazardous toxic gasses in the event of a train fire. Considering several tragedies of this nature, including the Madrid train station blasts in 2004 where 190 people were killed.

The fire safety and aesthetic requirements at the new Cologne-Bonn airport called for the first-ever application of vertical fire-resistant glass smoke curtains with point-fixed (spider) SGGVETROFLAM glass. Before its installation, the glass was successfully tested in an independent fire test laboratory in dimensions of up to 1150 x 3850 mm.

Vetrotech is now developing glass with similar dimensions for another airport project, this one at the Roissy-Charles de Gaulle Airport in Paris. The project will utilize SGGCONTRAFLAM STRUCTURE; an EI 60 fire rated "butt-joint"system with silicone sealing, in dimensions of up to 1250 x 3750 mm.

Fire resistant glasses, made by Vetrotech Saint-Gobain, are unique in terms of mechanical properties. All our glasses are tested for impact resistance and fulfil the highest classification for safety.

In addition, recent tests for explosion resistance according EN 13541 have proven that glasses, designed for combined safety can withstand the requirements and bring additional safety within blast and fire building components.

Thus, Vetrotech Saint-Gobain glass products comply with arguably the widest range of safety evidence available today for glass in passive fire protection for building and marine construction; this allows us to provide you with an up-to-date product range for specific requirements in safety.

Without forgetting the importance of design and architecture! IFP

If you have any questions regarding fire-resistant glass solutions for an airport project, please contact:
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Tel: +41 31 336 81 81
Email: infovsgi.vetrotech@saint-gobain.com
Website: www.vetrotech.com

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Employing multiple to reduce fire dete

Highlighting the fire detection capabilit

By Ulrich Oppelt

Product Management-Business Unit Fire, Bosch Security Systems

The most common drawback in fire detection is the incidence of false alarms. The main criterion in fire detector design, therefore, is to ensure as high a level of reliability as possible in a non-fire situation to avoid the triggering of false alarms. Bosch Security Systems has developed a sophisticated solution to false alarms based on multiple sensor technology. This article describes how false alarm signals are generated, and the various parameters and characteristics of different types of fires and their sources. Aspects of Bosch's solution are discussed, including rationale, development, implementation and test methods. The article continues with a description of a Bosch detector that employs multi-sensor technology and concludes with a comment on the feasibility of even further reducing the incidence of false alarms.

Key considerations

The incidence of fire detector false alarms in the home and in commercial premises is high. In the UK in 2005, for example, there were more than a quarter of a million false detector alarms causing fire brigade call-out. Most other countries have similar experiences, all resulting in expensive waste of time and money. Fire detectors are deployed in their hundreds and thousands in a high number of applications and extremes of environment. These extremes range from homes and office buildings with relatively clean and stable airspace, to warehouses and industrial areas with varying degrees of pollution, through to smoky clubs, restaurants and other public places, as well as kitchens with high temperatures.

In cases of genuine alarm, the most frequent cause of triggering a fire detector is the smoke caused by the fire. Because there are many different types of fire depending on the burning material, there are different rates of burning and, therefore, different types and volumes of smoke. The optimal detector should be able to operate with equal efficiency in all fire conditions.

The majority of detectors rely on at least one optical sensor that operates on the scattered light principle. This employs an LED in the measuring chamber where any smoke particles present will scatter the light from the LED. A photo diode then enables an electrical signal to be produced that is proportional to the density of the smoke. The limitation here is that an optical sensor may also provide a detection signal from dust particles, vapour or aerosols that it senses as smoke, thus triggering a false alarm. Some detectors use an ionisation sensor for detection of small-particle smoke. Other types of single-sensor detectors are based on heat or gas detection. Today, many manufacturers of fire detectors offer multi-sensor models that combine smoke, heat and gas detection. In this case, the combination of optical and heat sensors makes the use of an ionisation sensor redundant.

With modern technology the probability of a false alarm is relatively low, as is the probability of a real fire. Nevertheless, the incidence of false alarms in relation to the number of fire detectors installed in a given system is an important parameter in the choice of detector and its functionality. Figure 1 illustrates the frequency distribution for false alarm signals compared to those of a real fire.

The diagram shows how an alarm is triggered when the signal level exceeds a certain pre-set threshold level, the minimum setting of which is determined during standard test procedures. The shape of the disturbance curve in the diagram is theoretical. In reality it would drop much more steeply, but is sufficient to indicate the critical point where the two curves intersect in the vicinity of the threshold level.

Determining false alarm incidence

The probability of false alarms is influenced by a number of conditions, or technical measures, usually determined according to industry standards, one such being the EN 54 standard. An additional, non-technical, measure is to reduce the number of detectors in an environment suspected of containing a high level of dust, vapour or aerosol particles. Technical measures include sophisticated signal processing and evaluation of time curves from different kinds of combustible materials in a test situation and comparing with simulated noise signals. In a single-sensor detector, a signal is generated proportional to the density of the smoke or temperature level surrounding it.

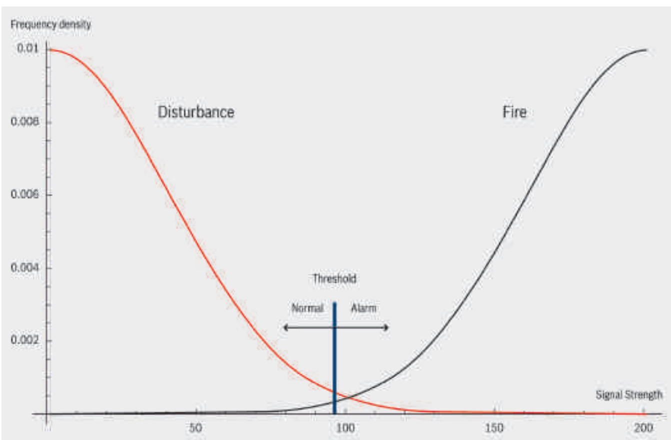


Figure 1 – Frequency distribution of disturbance signals relative to fire detection signals

Detecting more than one parameter

In test situations and in practice, a single-sensor detector, with its extremes of sensitivity, is more likely

sensor technology
ctor false alarms

ies of Bosch Security Systems

EVENT (Test File)	SCATTER SIGNAL	TEMPERATURE	CO SIGNAL	REMARKS
TF1	some	more	more	
TF2	very much	nothing	nothing	
TF3	very much	nothing	very much	
TF4	much	some	more	
TF5	much	more	more	
TF6	nothing	very much	nothing/some	
TF7	very much	some	more	
Disco 'fog'	very much	nothing	nothing	
Cigarette smoke	some	nothing	more	CO concentration Similar to TF1
Welding (autogenous)	some	nothing/some	more	CO concentration Similar to TF1
Welding (electro)	much	nothing	some	
Auto garage	some	nothing	very much	High CO values
Diesel aggregate	some	nothing	very much	

Figure 2 – Classification of signals from detected smoke, heat and gas parameters

to generate false alarms than a multi-sensor detector. There are, however, situations where a cost-effective single-sensor detector solution may prove adequate – usually in an application where the environment is relatively clean and stable. On the other hand, there is evidence that systems using multi-sensor detectors have, as a rule, a lower incidence of false alarms than those with single-sensor detectors.

Smoke detection is the most frequently used parameter in fire detectors. Since fire, in addition to different kinds of smoke, also produces gases and causes temperature increase, it is logical that these other parameters should also be detected in order to obtain an optimally reliable method of fire warning and prevention. In the case of heat detection, the detector must be sufficiently close to the source of the fire – closer than if only smoke is to be detected – in order to produce a meaningful signal. This is because, in many cases where a fire is slow-burning, the increase in ambient air temperature is usually considerably slower than the rate at which smoke is produced. Experience shows that the most effective heat detection sensors employ thermistor technology. Some detectors use infra-red to detect temperature radiation but they are mostly used only in specialized applications.

There are many effective fire detectors in use today that employ both smoke and heat sensors. For optimally reliable fire detection, gas detection is often also used together with smoke and heat detectors. The most common gas emitted by fire in an enclosed space is carbon-monoxide (CO), while nitrogen-oxides and hydrocarbons may also be produced, but in smaller amounts. However, CO is not only produced by a burning fire, but is also present in a heavily smoke-laden atmosphere such as that found in a night club with a concentration of cigarette smokers, and in garages and industrial workshops. A single-sensor detector for CO or other gases would mostly only be used in applications where a probability of one of these gases is suspected.

Signal evaluation & classification

Useful signal analysis of all three parameters – smoke, heat and gas – is necessary to determine whether an alarm is false or not. Firstly, in the presence of dust it is likely that the optical sensor will detect this and produce a signal, while the heat sensor and the CO sensor may detect nothing. The table in Figure 2 shows the classification of signals from parameters produced by optical, heat and gas sensors with documented test statistics.

The classification is explained as follows:

Nothing – no measurable signal that could be linked to the event

Some – a signal that could be linked to an event but too small from which to make a clear decision

More – a signal close to the threshold value for a single sensor but does not fully meet its value

Much – a signal that just exceeds the threshold value

Very much – a signal that clearly exceeds the threshold value.

The table shows the evaluation of signals from each sensor. The two test files TF1 and TF6 showed that a single optical sensor could not detect smoke. The results shown for combined optical and heat sensors indicate that with all fire events producing 'much' smoke, there is also 'some' heat. Conversely, and for most events, where there is 'nothing' shown under Temperature, there is 'very much' smoke. It can therefore be concluded that the combination of an optical sensor with a heat sensor can reduce the incidence of false alarms, especially with noise parameters that have the characteristics of smoke. Most importantly, the table confirms that a detector employing all three types of sensor – optical, heat and gas – is the most effective in reducing false alarms. Such a device is known as an OTC (Optical, Temperature, Chemical) detector.

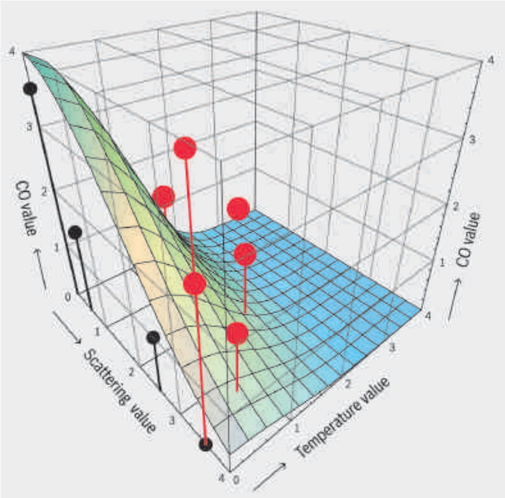


Figure 3 – Orthogonal representation of noise and true signals from three sensors

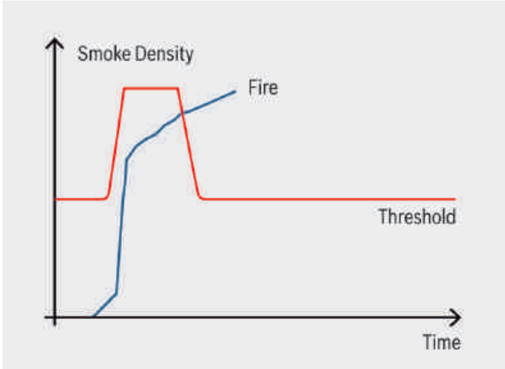


Figure 5 – Rapidly rising true alarm signal progression

The Bosch OTC solution

Development engineers at Bosch Security Systems have taken the classification signals and other data to plot a three-dimensional, orthogonal diagram (see Figure 3). This demonstrates that all noise parameters are below a certain threshold level and would not trigger a false alarm, while signals from test events are above the threshold and would trigger a reliable alarm. The diagram also shows that those noise parameters only activating the optical sensor have a significantly lower effect in the overall system. Evaluation of the signals along the time axis allowed a detailed assessment of the overall performance of a theoretical model on which Bosch based the design of its OTC 410 multi-sensor detector. A further development of this detector is the OTC420 with Bosch's Local SecurityNetwork improved version (LSNi) bus system technology.

The OTC uses algorithms on a rule-based approach that simultaneously evaluates the spatial distribution and dynamic behaviour of the signals and considers the following criteria before triggering an alarm:

– rapid increase of signal
– constant or fading signal level
– increase in temperature
– increase in CO concentration

The time curves in Figure 4 illustrate the dynamic behaviour of the optical signal, which, in the event of a fire, is assumed to increase steadily, while the false signal rises rapidly and then fades.

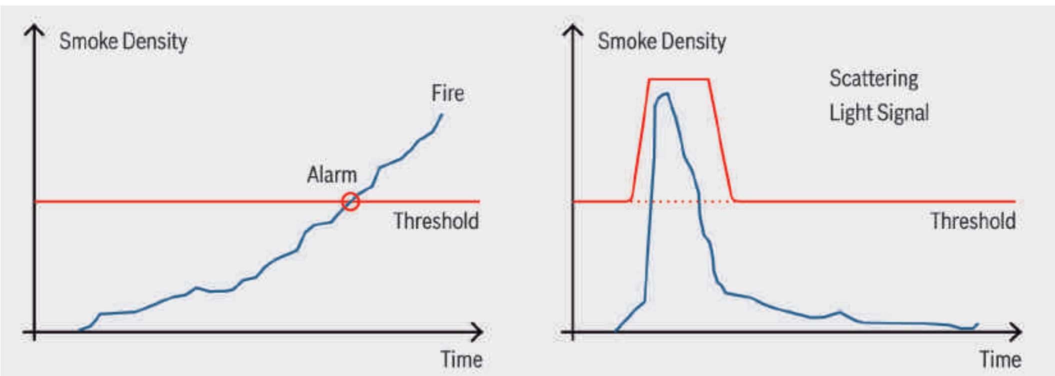
Assessing the time course allows adjustment of the alarm threshold to the signal increment rate. If the increment rate is steady and typical for a fire, the threshold level will remain unaltered and the detector will trigger an alarm. If the increment rate is rapid and changes abruptly, as with a disturbance signal, the threshold will be momentarily increased. In this case the optical threshold is changed to a less sensitive range to avoid the triggering of a false alarm. Figure 5 Illustrates the case of a rapidly rising signal first considered to be a noise parameter, but subsequently analyzed by the detector as a true alarm event.

Extended field trials of Bosch's OTC multi-sensor detector confirm stable performance in the presence of noise parameters. Now, after a number of years of use in applications of various sizes and types, the OTC has performed even better than expected. Moreover, false alarm rates have been determined by recording differentiated statistics in further extended, critical-condition field trials with a single-sensor smoke detector and the OTC. The OTC reliably suppressed false alarms repeatedly triggered by the single-sensor detector. The superior performance of the OTC is similar to other multi-sensor detectors in Bosch's 300 and 500 Series. Outstanding experience with these detectors and further improvements in multi-sensor technology led Bosch to develop the 420 and 520 Series. The choice of model, possibly including a combination of multi-sensor and single-sensor detectors, depends on the type and size of application and its environment.

Conclusions

Thorough analysis of the results of several signal parameters of real and false alarm situations in both test and actual conditions clearly provide useful data that helps differentiate between actual fire and false signals. There is ample proof that, in most applications, a smoke, heat and CO multi-sensor detector will provide more reliable reduced incidence of false alarms than a single- or dual-sensor detector. Bosch Security Systems' OTC multi-sensor detector employs state-of-the-art technology to provide superior, cost-effective fire protection in a wide range of applications and environments. The company strives in its development programs to investigate whether more improvements in detector design can be made that may lead to even further decrease in the incidence of false alarms. IFP

Figure 4 – Time curves of fire (left) and disturbance (right) parameters



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Advanced Fire Systems Inc.

Ax series fire control range

Advanced Fire Systems' engineering team was given the rare opportunity to create a completely new range of NFPA/UL certified fire control and indicating equipment that was not constrained by existing designs.

The result, described here by Mike Troiano, President and CEO of Advanced Fire Systems Inc., is the ***Ax*** product range, which he considers to be cleverly designed, loaded with rich and powerful features and he says "has some new innovative benefits that are sure to gain the attention of fire system consultants and specifiers."

As with any new design, it is important to fully specify the essential features to be incorporated into the product. In the case of the ***Ax*** range these features were defined to include:

- Full compliance to latest NFPA and UL standards
- Small cost efficient system, expandable for very large networked applications
- Full peer-to-peer, fault tolerant networking
- Intelligent 'plug in and play' option cards
- Utilises the latest intelligent field devices including multi sensors, CO, flame and beam detectors
- A 5 amp power supply and charger for the standard 2 loop system with supplementary 5 and 10 amp supplies for larger system requirements
- Onboard NAC circuits, each rated at 2A, Programmable, Class A (Style Z) or Class B (Style Y)
- Full analog support for pre-alarm and alarm with individual device drift compensation and contamination indication
- Extensive cause and effect programming capabilities
- Advanced diagnostics to aid installers with finding faults on external wiring
- Optional onboard DACT
- Remote diagnostics and programming facilities
- Fully on-site programmable from either on-board keypad or PC

Efficient Design

Recent advances in digital electronic technology have allowed a number of desirable, but previously uneconomical features, to be incorporated into the panel as standard. Flash based microprocessors are used throughout the design, permitting new features to be easily added to panels already in the field without replacing memory chips.

The display card and other electronic circuits are housed within a robust, detachable chassis, to avoid the possibility of damage during installation. In addition, all of the field wiring is connected to the chassis via high quality plugs and sockets to assist in installation and servicing.

Trace Diagnostics

One of the potential problems with any fire system installation is the condition and integrity of its external wiring. This is usually most apparent during the initial commissioning procedure. However, once commissioned it is also important to continually monitor the wiring for any damage or degradation. The ***Ax*** series of control panels incorporates advanced ***'Trace'*** diagnostic features which, include highly accurate analog measurement and recording of all external and internal cable parameters and will report and record short circuits, earth faults and other conditions which could prove detrimental to the system operation.

Dynamix Zoning

By default, larger systems usually require an equally large number of zones to comply with fire regulations and to give non-confusing indication. Historically these installations easily exceeded the number of total zones allowed on a single panel or a multi-panel based networked system. Advanced use a '***Dynamix'***-Zoning programming technique within each panel, which overcomes these restrictions, allowing buildings with many hundreds of zones to be readily implemented from standard products.

Ad-NeT Network

Networking of fire panels is no longer restricted to the larger 'multi-loop', 'multi-storey' systems. The ***Ax*** products can be networked in a mix and match configuration that suits the specific application. The ***Ad-NeT*** network allows for fully regenerative, fault tolerant, loop based networking to be achieved over standard 'twisted pair' (or shielded twisted pair depending on the application). The actual network protocol allows full peer-to-peer report, control and site wide cause and effect functionality as standard and when used in conjunction with ***'Dynamix'*** zoning, allows a networked system to share up to 1000 zones.

PC-Net Software

A suite of PC based software has been designed to assist with the commissioning and control of fire systems. These programs are all Windows™ based and include a powerful configuration package for easy definition of loop devices, text, time clocks, cause and effect, etc., a remote diagnostics and control utility using a 'Virtual Panel' interface and a support package to allow the installer to change the logo that is shown on the panel's graphical display.

Conclusion

The ***Ax*** range forms a flexible cornerstone for Advanced Fire Systems' product base for the foreseeable future. In addition the company has a large development program underway. Much more is on the way! IFP

For more information contact:
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Website:www.afsi.us.com

Fire Expo launch of Siemens Sinteso F20

SIEMENS BUILDING TECHNOLOGIES (SBT) will be using Stand B10 at International Fire Expo for the official UK launch of the new Sinteso FS20, one of the most comprehensive and versatile fire detection systems available.

Sinteso F20 is the new family of fire detectors, control panels, communication networks and alarm devices.
International Fire Expo will provide both UK and international visitors with an opportunity to see this new development in technology, carrying forward the concept of the highest detection reliability from a system which can be integrated, expanded or adapted to changing building utilisation with ease.
SBT will also have a stand in the adjacent IFSEC exhibition (Stand 8048), primarily focusing on security products and systems but where information on the products and systems available in the fire protection range will also be available.

The new Sinteso detectors carry the quality seal of ASA Technology (Advanced Signal Analysis) and achieve unparalleled levels of detection reliability – false alarms due to simulated fires are practically impossible. The detectors guarantee a reliable response to almost all types of fire, even under the most difficult ambient conditions. Detection reliability is so high that Siemens offer a genuine alarm guarantee scheme where they will pay for the cost of a fire brigade call-out if this is caused inadvertently by a false alarm.
Sinteso detectors are compatible with previous Siemens fire detection systems and can be migrated to existing networks to a large extent. At present, over 1 million Sinteso detectors have already been integrated into systems all over the world, where they guarantee correct and reliable operation everyday.

Sinteso is based on a uniform technology platform that lays the foundations for the various system components. These include sensors, control panels, communication networks and alarm devices which work together in a smooth and coordinated manner to offer a total solution. As well as its complete functional reliability, Sinteso F20 provides significant advantages should the function of a building or its rooms change or when extensions are added. The modular structure and the use of standardised interfaces (BACnet) enables the system to be flexibly networked and adapted or expanded in response to changing customer requirements, without any major complications. It is also possible to network a panel with a remote control panel via Ethernet.

The new range of control panels enables SBT to cover all application segments with a uniform technological platform. For example, this ranges from the control panel for stand-alone applications right through to large-scale, complex systems. The field devices are connected via the specially developed FDnet (Field Device network). Furthermore, FDnet carries the power to the field devices, resulting in less expensive cabling. Several control panels are networked together using the high-performance FCnet control panel bus (Fire Control network). The newly developed control panel bus guarantees high-speed, efficient data transfer and makes it possible to configure the network topology largely without limitations (with copper and/or fiber optic conductors). The compact and modular design of the Sinteso range of control panels allows easy systems extensions or adjustments. The operating displays are standardised for all control panels and are configured to make them clearly comprehensible. All functions comply with the relevant standards (EN54) and can be carried out intuitively for all events.

For more information:
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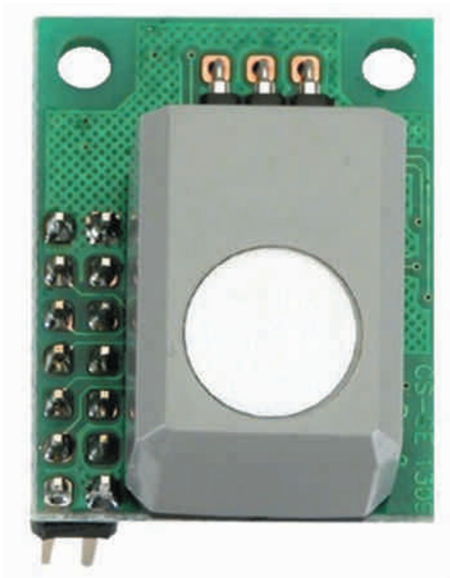
Remora CO modul for fire detector



REMORA CO is a new smart modul for use in residential fire detectors. It is a very small electronic board with a microprocessor inside, designed for gas sensing application, for use with 3-electrode Carbon Monoxide electrochemical cell sensor.

REMORA CO can be easily plugged into a fire detector, to create a multi-technology detector able to detect CO in conjunction with standard fire detection in theatres, cinemas,hotels ect. REMORA into the domestic stand alone fire detector offers you and your family a double protection.

The CO electrochemical cell sensor inside the REMORA is the most cost-effective CO sensor available today. Long life and leak-free guaranteed. Flat design for CO Fire detector applications.

The signal input from the sensor is processed digitally by the microprocessor, which also stores information like calibration data, the range and lifetime of the sensor. REMORA can be interrogated digitally, with information such as alarm thresholds, fault conditions, calibration information etc., being available from the microprocessor.

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Website: www.sensitron.it

PPG Protective & Marine Coatings

PPG Protective & Marine Coatings was launched in August 2006 as a result of PPG's acquisition of Ameron Performance Coatings & Finishes worldwide. We manufacture and supply high-performance coatings for a variety of industries, including oil & gas, power, chemical, marine, offshore and infrastructure markets.

PPG Protective & Marine Coatings are world leaders in the development and supply of performance coatings to protect steel and concrete structures from fire and corrosion around the world. We work closely with the world's leading architects and engineers to enhance the use and appearance of our fire protection products across many industries, like the construction industry, petrochemical and chemical processing industries and for railway and road tunnels.

Thin film intumescent coatings

A thin film intumescent coating is the passive fire protection method that enhances the visual appearance of a structure and will even add to the design with decorative finish and colour. This allows architects to show the steel construction while at the same time protecting its structural integrity in case of fire allowing safe evacuation and ensuring access time, required for rescue workers. Thin film intumescent coatings are commonly used on steel frame structures in commercial, leisure, airports, education, retail, stadiums, manufacturing and industrial sectors.

A thin film intumescent coating is the passive fire protection method that enhances the visual appearance of a structure and will even add to the design with decorative finish and colour.

PPG offers a range of intumescent coating systems for various grades of fire protection, various weathering exposure conditions and application techniques while complying with many national and international legislations and standards.

Epoxy intumescent coatings

The epoxy intumescent coating Pitt-Char XP offers outstanding fire protective properties. When exposed to fire, its unique chemical composition transforms its surface into a ceramic-like, insulating char that provide thermal protection for the substrate – even under hydrocarbon and jet fire conditions. Because Pitt-Char XP is an epoxy, its tough durable coating provides a dense shield to the elements. Pitt-Char XP can stand-up to solvents, acids, alkalies, salts and abrasion. That in combination with its unique flexibility makes Pitt-Char XP the best choice for harsh environments. Pitt-Char XP successfully protects refineries, chemical plants, offshore platforms and a variety of other high-risk industrial facilities all over the world.

Cementitious fireproofing

PPG also supplies a complete range of vermiculite cement fireproofing products under the trade name Steelguard CM, which protect the steel in two ways. Firstly, they contain trapped water of crystallisation, which in a fire situation will be released and keep the steel around 100°C until the water has all been released. The product then acts secondly as an insulator.

Custom made solutions can be developed to ensure dependable and compliant fire protection.

Specialized product versions are available for interior and exterior use providing protection to civil constructions but also in refineries, chemical plants and tunnels.

Service

Large projects frequently require additional fire engineering in which the coating supplier, designer and contractor develop solutions for specific project applications and construction solutions to meet all fire protection requirements. With an experienced coatings supplier like PPG who is equipped with the latest laboratory facilities for formulating and fire testing, custom made solutions can be developed to ensure dependable and compliant fire protection. IFP

PPG Protective & Marine Coatings

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Innovative Products from RELIABLE

K-22 ESFR
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- Lower flows offer opportunities to reduce:
  • Interior Piping • Underground Pipe • Fire Pumps Sizes • Tank Sizes
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F1FR EPEC, K-115, Enhanced Protection Extended Coverage Pendent
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- Reduced installation cost by using less sprinklers and system branch pipes
- Reduced water storage volume to 30 minutes instead of 60 minutes

N252EC, K-25 EC Pendent & Recessed Pendent
- Extended Coverage for Density/Area Design
- Approved for coverage up to 18 square meters (4.3m x 4.3m) for Extra Hazard and Storage Applications

J168, K-16.8 Upright
- New Control Mode, Density/Area Upright Sprinkler
- Primarily for Extra Hazard and Storage Occupancies as designed and installed under NFPA 13 Requirements
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DDX Valve
- cULus Listed and FM Approved for Deluge, Preaction & Dry Applications
- Only one main drain, 17,2 bar (250 psi) rated
- Lightweight, both ends grooved

E3 Alarm Valve
- Both ends Grooved for ease of installation for 100mm (4"), 150mm (6"), 165mm, & 200mm (8") sizes
- Segmented trim reduces labor costs

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Ductwork fire protection:

Get it right or risk fire spreading throughout the building

By The Association for Specialist Fire Protection (ASFP)

In commercial buildings, compartment walls and floors will have a prescribed fire resistance period, which means that the performance criteria of load-bearing capacity (stability), integrity and insulation have been met for a duration of 30 to 240 minutes.

It is, therefore, vitally important for fire security that where compartmentation boundaries are penetrated by building services, the fire separation and the performance criteria for the penetrated wall or floor are maintained and in particular, that all forms of ducting in a building should not become a conduit along which fires may spread to other areas. The fire performance of a duct which penetrates a fire resisting/separating element requires careful consideration by specifiers and controlling authorities. The standard periods of stability and integrity should in all cases be at least equal to those required for the penetrated element.

Essentially there are three ways in which the integrity of compartments may be maintained where ventilation and air conditioning ductwork penetrate fire separating elements, namely:

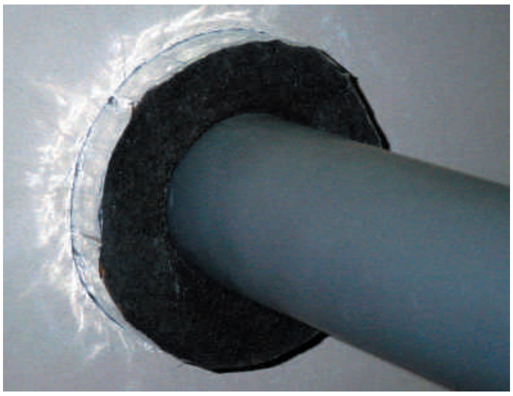
- Protection using fire dampers
- Protection using fire resisting enclosures
- Protection using fire resisting ductwork.

A fire damper is a device which is installed/positioned at the point where the duct penetrates the compartment wall or floor. The fire damper allows the passage of ventilation air in normal conditions through a duct, wall or partition; but closes automatically to prevent the passage of fire (in a fire condition) for a stipulated time period. The mechanisms employed for closure include the use of a fusible link, which will fracture at a specified temperature to release a closing mechanism, or the use of intumescent coated matrices which will intumesce under fire conditions to close the gaps in the matrix.

Fire resisting enclosures are constructed without a steel lining duct using self-supporting board and casing systems made from calcium silicate and cement based products. These materials provide fire protection in two ways, the first being the ‘cooling effect’ when the trapped moisture (physically and chemically bound) evaporates as the temperature of the surrounding fire increases. Once all the moisture has turned to steam the product then behaves as a thermal insulation material.

Fire-resisting ventilation or extraction steel ductwork is designed using proprietary materials and fixing techniques to contain fire and the products of combustion, in a manner that does not allow passage to other parts of the building from the compartment of origin, for a stipulated time period.

The use of any fire protection product can be undermined by poor installation. Any work that is not of the correct quality could lead to premature collapse of a building in a fire situation. This, in turn, could threaten the lives of the occupants and the fire fighters. Thus, it is imperative that



contractors who have the appropriate credentials for the work install passive fire protection products for steel fully in accordance with the manufacturers' instructions.

Third Party Certification schemes are in operation for installers of passive fire protection. These ensure that the installing companies and their operatives have the required level of expertise to properly carry out the job. The latest edition of the Fire Guidance document to the England and Wales Building Regulations (Approved Document B) which took effect in April 2007 states:

'Building Control Bodies may accept the certification of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard.

Similarly, Building Control Bodies may accept the certification of the installation or maintenance of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard.

Nonetheless, a Building Control Body will wish to establish, in advance of the work, that any such scheme is adequate for the purposes of the Building Regulations.'

Each type of product is susceptible to particular problems, which should be checked during installation.

Fire dampers are designed to be installed in the line of the cavity barrier, fire wall or compartment wall/floor through which the ductwork passes. If they are not in the line of the fire division, then fire can by-pass the damper system. The fire damper assembly should be independently supported so that failure of the duct will not cause failure/collapse or disturbance of the damper mechanism in the line of the wall. Ducts also need to be adequately supported so that no undue load is applied to the fire damper due to distortion of the duct. This can prevent the fire damper from closing properly, or not at all. It is also important that the fire damper has been tested (or assessed) for the particular type of wall or floor in which it is to be installed.

Board systems for self supporting fire resisting enclosures may have different fixing systems for different ratings and the inspector should make sure that the appropriate one is being used. In particular, it should be ensured that all fixings/hangers/stiffeners are of the correct grade of material and that they are installed at the appropriate centres. Adhesives will also be required and the type may vary according to the pressure design of the enclosure.

Steel ductwork systems for air movements around buildings are generally constructed to the HVCA guide DW/144 (formerly 142) 'Specification for Sheet Metal Ductwork' which is a document covering a wide range of construction standards in the manufacture of sheet metal ductwork for use in low, medium or high pressure applications. It includes various methods of jointing, stiffening and supporting of the ductwork.

BS 5588: Part 9 paragraph 7.5.1 acknowledges that steel ductwork *'if satisfactorily constructed and supported will be able to provide a high degree of resistance to the passage of smoke and decomposition products. However, rapid transfer of heat through the steel regardless of its thickness prevents the ductwork achieving any degree of fire resistance without supplementary insulation'*. A satisfactorily constructed and supported steel duct is one proven by test and/or assessment to BS 476: Part 24. The inspector should make sure that the fire resistant duct that is installed onsite conforms to the requirements of its supporting fire test and assessment documents.

Building managers will need to be aware of the ramifications of the Regulatory Reform (Fire Safety) Order (RRO). The provision and maintenance of the fire rated ductwork and fire dampers within the building should form part of the risk assessment carried out under the RRO for the building. Managers need to be aware that there may be liability issues in the failure to comply with regulations (e.g. as a criminal act). Where fire resistant ductwork and fire dampers have to be removed or have become damaged for other purposes, they must be made-good as soon as possible. Ideally, where the operation and maintenance data for a building is available and the 'as-built' products can readily be procured, any changes and repairs should be carried out with the materials originally specified. Suitably skilled, experienced and accredited personnel must carry out such works in accordance with the manufacturer's recommendations.

The Association for Specialist Fire Protection (ASFP) publishes 'Fire Resisting Ductwork'. This publication, known as the 'Blue Book', has just been republished in its second edition and is recognised as the industry guide. The ASFP also publishes Fire and Smoke Resisting Dampers, commonly refereed to as the grey book. All ASFP publications are available as free downloads from the association's website, www.asfp.org.uk

But what if the product/system has not been fire tested at all, or has test data that is not appropriate to the job at hand? For example, where it is not possible to subject a construction or a product to a fire test because of its size or where the test data applies to a similar, but not identical system.

In these cases an assessment carried out by a competent fire engineer will be required and it is recommended that guidance contained in a booklet entitled "Guide to Undertaking Assessments in Lieu of Fire Tests", published by the Passive Fire Protection Federation (PFPF) should be followed. This document is also available as a free download from the ASFP's website. This document breaks out assessments into three levels of complexity, namely simple, intermediate and complex. It also discusses the requirements of assessors and identifies four levels of experience. These levels are then related to the complexity of the required assessment.

The ASFP stands ready to advise the specifier, building owner, and fire safety engineer with regard to the use of ductwork fire protection. Failure to install the appropriate fire protection systems could lead to fire spreading quickly throughout a building leading to its loss, the loss of the ongoing business and worst of all, life! IFP

Innovative solutions boost fixed foam systems' performance

Technological innovation and new foam concentrates are having a major impact on the use and effectiveness of fixed foam firefighting systems. So says Peter Kristenson, EMEA Product Manager for foam products with Tyco Safety Products Fire Suppression Group.

By Peter Kristenson

EMEA Product Manager, for foam products with Tyco Safety Products Fire Suppression Group

Fixed foam systems come into their own where there is no alternative to having the firefighting equipment in position, in a state of permanent readiness and covering the entire area at risk. Typically, these are applications where response time is critical; where assembling the firefighting crew and bringing mobile firefighting equipment to bear is either too time consuming or inadequate in relation to the magnitude of the fire risk. They are applications where the threat to business continuity or to the availability of an essential service, the potential risk to life, or impact on the environment means that the swiftest and most effective fire suppression is essential.

Applications that immediately spring to mind include high risk or high asset value sites such as onshore and offshore petrochemical facilities, merchant and military shipping, civil and military aircraft hangers. The list also includes a number of industrial manufacturing and storage applications where highly volatile and highly flammable commodities such as fuel, chemicals, plastics, paints and pharmaceuticals are processed or stockpiled.

A good deal of the technology has been around in one form or another for some time. The use of high-expansion foam systems and low-expansion foam sprinkler systems in enclosed buildings, and fixed foam oscillating monitors for providing

external protection is now reasonably well established. Important steps forward have though been achieved in the remote control of fixed monitors with long throw capability and fast knock-down potential. These developments have proved particularly effective in offshore applications and on exposed sites, where high gusting winds are frequent. In such applications, fixed monitors have shown to cost effectively protect bund and dike areas, jetties and truck loading racks with their associated risk of spill or ground fires.

Innovative new technology

One area where technology has recently stepped in is in the development of a new solution for the protection of enclosed industrial spaces, such as warehouses and distribution centres. Where previously either high-expansion foam systems or low-expansion foam sprinkler systems were the accepted solutions, the introduction of a Hi-Ex foam that utilises smoke-contaminated air was a key factor in the development of the new HOTFOAM® system. It can be used effectively on hydrocarbon and polar solvent liquids, as well as solid combustibles, such as rubber, plastic, wood, paper and chemicals.

HOTFOAM is a SKUM™ brand solution that is less costly in terms of both the hardware and the installation, incorporating a unique new foam concentrate and a new foam generator. It operates on different principles to conventional Hi-Ex systems, with the foam generators being located inside the protected space, enabling them to using the air and smoke from the fire itself to generate foam bubbles. This allows simultaneous foam production over the entire protected area, reduces smoke gas emissions, and ensures fast knock-down of the flames and heat. It is also a

major step forward in minimising damage to the structure and its contents.

The new system has several other advantages. It does not require air ducts, wall openings, or additional smoke ventilation to be provided. HOTFOAM uses less water than conventional systems, requires less maintenance, and pipe positioning is simpler. There is also greater flexibility regarding the positioning of foam generators, as the low-weight generators can be hung directly in the supply pipes. The system requires a smaller capacity pump and the generator has no moving parts. With HOTFOAM there is also significantly less contaminated water to contain, and minimal secondary damage.

A HOTFOAM foam station comprises a water source and pump: foam proportioner; HOTFOAM generators and the SKUM METEOR P® foam concentrate in a foam concentrate tank; the HOTFOAM control system; valves; fittings and piping.

Early tests proved that the introduction of smoke gases in the air supply to conventional high-expansion generators reduces, or completely eliminates, the need for foam production by the generator.

The introduction of HOTFOAM followed more than a decade pioneering the technology of producing high-expansion foam using smoke-contaminated air. Early tests proved that the introduction of smoke gases in the air supply to conventional high-expansion generators reduces, or completely eliminates, the need for foam production by the generator. The same was found to be true if the air supply, in addition to containing smoke, gas and particles, is also very hot.

The technology has proven to be so successful that HOTFOAM systems are now also safeguarding marine machine rooms and tunnels – including cable tunnels, vehicle and rail tunnels – chemical and petrochemical processing plants, transformer stations and enclosures where an efficient fire fighting system is required that utilises a minimum amount of water.

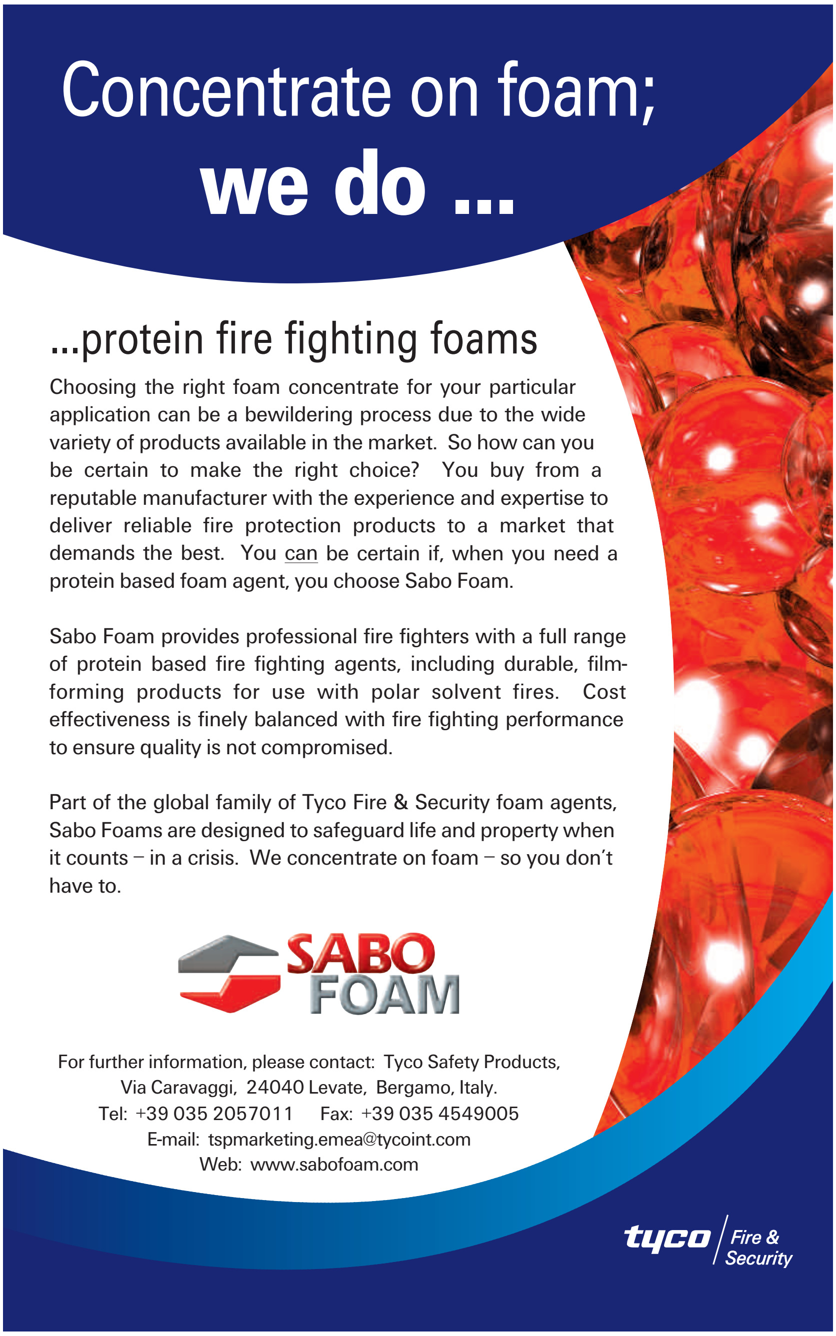
New foam solution

Not that all of the innovation has been focused on delivery systems. New foams are being developed that are applicable to fixed systems, such as THUNDERSTORM® ATC 1 x 3. It is a new generation of alcohol resistant AFFF foam concentrate developed by ANSUL® and Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable gases and liquids.

THUNDERSTORM is specifically designed to fight fires in oil refineries, where there is never any scope for compromise or second best. It is formulated to ensure the fastest, most reliable and safest extinguishing of a fire.

Indeed, the intimate involvement of Williams Fire and Hazard Control in the development of THUNDERSTORM is surely an indisputable testimony to its premium performance. Dwight Williams' teams battle some of the fiercest fuel storage tank and oilfield blazes around the world, so is insistent on equipping his experts – many of whom are family members and long-time friends – with only the best products that the world's leading foam technologists can develop. Having tested THUNDERSTORM under conditions far exceeding normal agency standard approvals, it has recently been described as "the most potent weapon in Dwight's firefighting arsenal".

THUNDERSTORM is a complete safety solution for the petrochemicals industry, as it combines the foam itself with unrivalled technical support and assistance. It uses new technology and has a dramatically reduced viscosity when compared with other 1 x 3-listed polar-solvent type AFFF concentrates on the market. This enhances the foam's performance in all types of foam



proportioning equipment, including in-line eductors and balanced pressure systems.

It can be used as a three percent solution on fires involving polar solvents, such as acetone, methanol and methyl ethyl ketone, and a one percent ratio on fires involving hydrocarbons such as high-octane petrol, aviation fuel and naphtha. These are the two most common types of flammable liquid fire that can occur in an oil refinery, and these low ratios simplify foam storage and dispersement around the site, and greatly increase the "staying power" of the fixed firefighting foam systems.

Other characteristics of the new foam include the speed at which it spreads across the surface of a tank fire and seals against the hot metal surfaces on the inside of the tank. Its excellent wetting characteristics also make it ideal for fighting Class A fires. High volume streams of THUNDERSTORM can be discharged from foam generators – located several hundreds of metres away from the tank – without causing turbulence when it hits the surface. The foam has good fuel shedding capabilities to extinguish the fire without knocking a hole in the foam blanket.

THUNDERSTORM extinguishes a fire in three ways. First, with a fire involving a conventional hydrocarbon fuel, an aqueous film is created; in a polar solvent fire, a polymeric membrane is formed. This film or membrane creates a barrier to help prevent the release of fuel vapour. Second, regardless of the type of fuel, a foam blanket is created that excludes oxygen, and from which the liquids that form the film or membrane drain. Third, the water content of the foam produces a cooling effect.

THUNDERSTORM can be used with fresh, salt or hard water, and is formulated from special fluorochemical and hydrocarbon surfactants, high molecular weight polymers and solvents, and can be transported and stored as a concentrate. This ensures ease of use and considerable savings in weight and volume. Typically, aspirating discharge devices produce expansion ratios of between 5:1 and 10:1, while non-aspirating devices such as hand-line water fog/stream nozzles or standard sprinkler heads are between 2:1 and 4:1. Medium-expansion discharge devices produce ratios of between 20:1 and 60:1, depending on the type of device and the operating conditions. IFP

Protecting our

By Nigel Pollard

Honeywell Fire Safety

Nigel Pollard of Honeywell Fire Safety looks at the role of fire safety systems in listed buildings.

University College London's Grade 1 Listed Wilkins Building

In developing an appropriate fire safety solution for a public amenity, the use to which the building is put is typically much more important than the age of the building.

As a result, if a primary concern is to protect the fabric of the building or its contents, the proposed solution is likely to be broadly similar, irrespective of whether it is a new build or an historic architectural jewel. Similarly, if a leisure facility typically attracts especially large numbers of visitors within a restricted, enclosed space, the type of life safety solution and stringent evacuation procedures adopted are more likely to vary dependent on the layout of the building rather than its age.

A question of age

Things start to change significantly, however, when it comes to detailed specification and installation.

In most cases, installing a fire safety solution in a new build is much simpler and more straightforward. Historically, fire safety was often regarded as an after-thought or a 'bolt on': today, by contrast, architects and consultants increasingly recognise the inherent importance of life safety provision within building design and so involve third party fire systems specialists early on in the development process.

In so doing it ensures the best possible solution, with wiring discreetly installed in the ceiling void or floor space as part of the initial design, rather than having to compromise or adapt the architect's original intentions by accommodating fire safety requirements too late in the process.

In the case of an existing building, by contrast, the infrastructure is already in place, making the replacement of, or addition to, an established fire safety solution more complex. And, if the building has listed status as a result of its architectural importance, any redevelopment can be especially problematic.

Four recent examples illustrate the importance of marrying state-of-the-art fire protection within buildings having protected status:

• University College London

University College London's (UCL's) Grade 1 Listed Wilkins Building has included full fire protection as part of a major phased refurbishment programme, currently underway.

The installation in the Wilkins Building – one of London's architectural 'jewels' designed by William Wilkins, who was also responsible for the National Gallery in Trafalgar Square – includes Four five-loop Morley-IAS ZX5e networked fire alarm control panels, seamlessly integrated with Apollo detection devices.

The Morley-IAS addressable solution replaces a previous radio-based system and, says senior estimator, Tel Fisk, of Fire Systems Distributor, Fisk Fire Group, "provides the level of flexibility, robustness and security essential in a major Listed building

heritage

which includes a large refectory, UCL's administrative centre and main Library."

Until the late 1990s, UCL – also known as "London's Global University" – worked with a number of different fire systems, protocols and service providers across its broad 180-strong estate in Central London and the Home Counties, ranging from halls of residence to museums housing priceless historical artifacts.

UCL then took the decision to rationalise its fire protection system, recognising the benefits of standardising safety provision with a single specialist provider, both in terms of operational efficiencies and to ensure a consistently high level of protection. Under the agreement, a long-term programme is underway in which Fisk is replacing all existing fire safety equipment with Morley-IAS panels and Apollo devices.

Implementation of the new fire safety system in the Wilkins Building started in spring 2006 and was completed in March 2007. Listed status has placed considerable constraints on implementation work, all of which has had to be undertaken overnight: further, the nature of the building's use as a centre for major University functions – often at short notice – has also required the timetable to be revised.

• Fulham Football Club

The oldest of London's first class football clubs, Fulham first saw the light of day as long ago as 1879. However, in recent years following the Taylor Report into ground safety it had become clear that the Club's Craven Cottage ground could no longer continue in its existing guise and Fulham would either have to move or extensively develop the current site.

Several sets of proposals were rejected by the Local Authority before the Club finally achieved planning approval in November 2003. After two years 'in the wilderness' therefore, sharing Queens Park Rangers' Loftus Road ground in North London, Fulham returned home to play Premiership football again at the start of the 2004-5 season.

"A key aspect of bringing our ground up to current FA standards was the need to provide adequate fire safety protection," recalls stadium manager, Dave Piggott. At the same time, the new fire system had to accommodate a number of major changes as part of the £8 million development. These included building two all-seater stands and the addition of extensive catering and hospitality facilities.

At the same time however, it also had to maintain full protection for Fulham's unique wooden Stevenage Road stand, which was subject to a Heritage Order and so could not be replaced.

In response, specialist fire safety contractor, Fire Alarm Solutions (FAS) was asked to develop a bespoke system with sufficient capacity to protect the new larger stadium and capable of meeting the Club's unique safety requirements.

The answer was a fully addressable solution and, as the existing system was running on an Apollo protocol, it was also seen as essential that the replacement was open-protocol.

The agreed solution was a Morley-IAS by Honeywell ZX5e control panel plus repeater, with four loops – one per stand – to provide the increased number of zones required. At the same time, the four stands were completely rewired, using Apollo's XP95 range of fire detectors. In addition, the environmental restrictions placed on the Stevenage Road stand required detectors to be placed under the seating and linked to a separate sprinkler system.

In matching the diverse requirements of a protected building alongside a brand new build, the ZX5e was seen to offer the ideal solution: an intelligent, open protocol fire alarm control panel, designed around proven and reliable microprocessor technology. This simple approach offers a modular, scalable platform ideal for protecting leisure facilities such as football stadia and other sporting arenas.

• De La Warr Pavilion

Commissioned by the 9th Earl De La Warr in 1935, the famous De La Warr Pavilion was the UK's first building designed in the Modernist style. The steel and concrete structure was originally designed to provide accessible culture and leisure for the people of Bexhill-on-Sea in Sussex and the surrounding area.

Seventy years later and with Grade One listed status, it has recently been the subject of a major £8 million restoration and redevelopment programme. Following a competitive tender process, the refurbishment incorporated full fire protection utilising a Notifier® by Honeywell ID2000 system and installed by Engineered Systems Distributor, Sovereign Alarms.

The Pavilion re-opened in October 2005 with the support of Arts Council and Heritage Lottery funding and today incorporates a 1,000 seat theatre, restaurant and bar and one of the largest contemporary art galleries in the South East. To meet this broader usage, it was recognised as essential to provide an addressable, L2-graded fire

De La Warr Pavilion

De La Warr Pavilion

protection system that met all the current building requirements including BS5839 certification.

The ID 2000 is a typical example of Notifier's suitability for leisure facilities and public arenas such as De La Warr, providing a highly cost-effective, fully addressable, intelligent fire protection system, which is easy to install, programme and operate.

Sally Ann Lycett of De La Warr Pavilion confirmed, "Notifier has provided a high level of protection for visitors, our staff and the magnificent building itself. It combines robustness and reliability with the flexibility required to meet our wide ranging needs."

After the success of the initial implementation, work is underway to provide extra workshops at the De La Warr Pavilion and Sovereign Alarms will provide additional smoke detectors and devices for the new facilities, which are planned to open later in 2006.

• Southover Grange

Southover Grange in Lewes is an Elizabethan house built in 1572 by William Newton, Earl of Dorset. Incorporating impressive public gardens, more recently it has been extended and today combines a Registry Office, residential accommodation and separate studio.

In 2005, owners Lewes District Council recognised the need to upgrade the existing fire system to L-2 standard for the whole site. In response, Sovereign Alarms designed a fully addressable solution, again based on Notifier's ID 2000 system, as the best way to reduce the volume of cabling and zonal wiring required throughout the building.

The front of the main building together with several rooms were Grade 1 listed and, as a result, detailed discussions took place with English Heritage, both with regard to choice of solution and its installation.

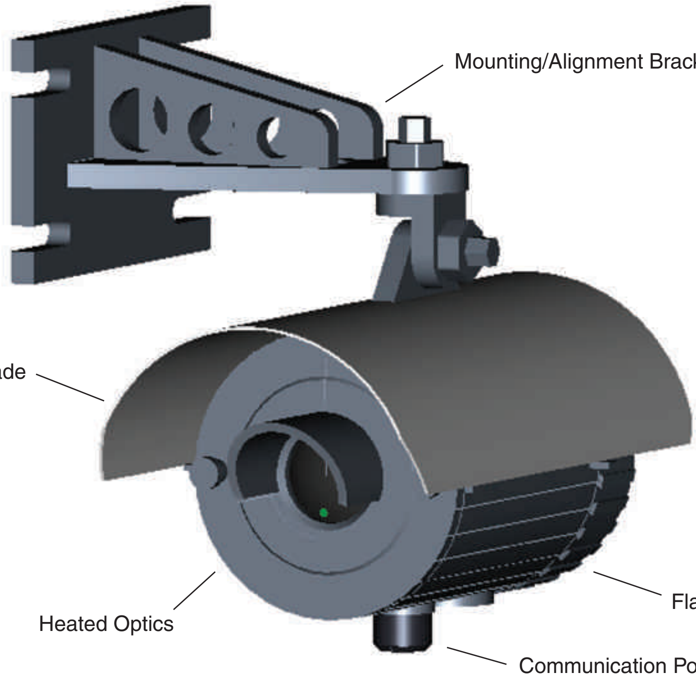
In particular, severe constraints were placed on the siting and appearance of the detectors. However, with long-standing specialist experience in dealing with such issues, a solution was developed which met both the need to preserve the building's heritage and at the same time provide a safe environment for both staff and visitors.

A commercial response

Having worked with Notifier® for 15 years, Sovereign Alarms believes that the product portfolio combined with business experience are the strengths of the company's fire safety solutions, which are equally suited to brand new builds, existing sites and listed buildings alike. Strong functionality, cost-effectiveness and market-leading reliability are key to meeting today's toughest commercial and safety demands, whether protecting a modern office block or historic theatre.

There is no doubt that developing life safety systems for historic buildings presents special challenges. Yet as such widely diverse buildings as De La Warr and Southover Grange, and UCL and Fulham Football Club ably demonstrate, the latest technologies sympathetically installed can provide the highest levels of protection for both people and property – without detracting from the inherent visual impact of the landmark building itself. IFP

Sencient Detector/Receiver



Open Path Gas Detection

with Enhanced Laser Diode Spectroscophy (ELDS™)

Open Path Gas Detectors (OPGD) utilizing NDIR detection techniques have been in use since the late 1980's and are widely accepted for many Oil & Gas, Petrochemical and other industries for combustible gas detection applications. OPGD systems are currently used to monitor hydrocarbon gas leaks at offshore and onshore oil and gas production facilities, refineries, petrochemical plants, gas transmission stations and many other industrial facilities.

By Jean Berthold, VP, CMO

Senscient, Inc.

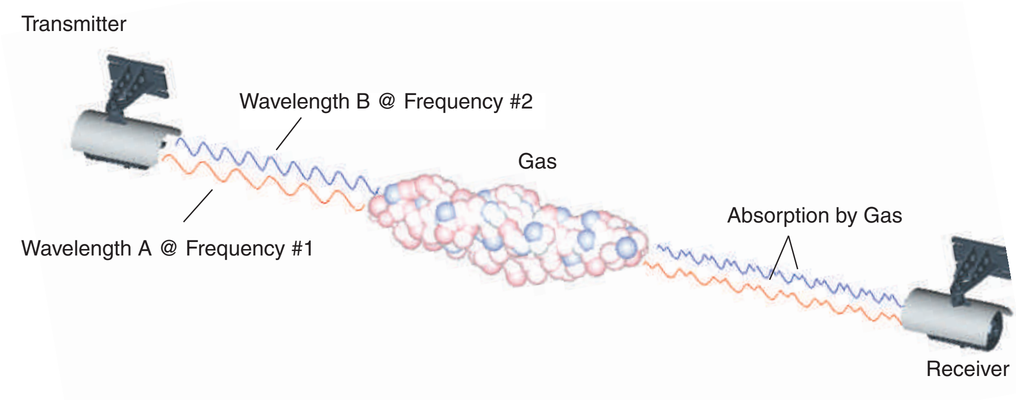
The earliest NDIR OPGD systems were plagued with environmental interferences and failed to provide consistent performance when exposed to direct sunlight or weather conditions such as rain, snow and fog. In order to cope with these environmental challenges, designers of OPGDs pushed NDIR technology to its limits, but this has left little room for further improvement. Consequently, there are many demanding flammable gas detection requirements which cannot be adequately met using NDIR-based equipment. HVAC ducts and turbine acoustic enclosures are examples of applications where NDIR-based systems cannot meet the needs of many customers.

In order to address the most demanding flammable gas detection requirements and to provide the first reliable open path toxic gas detector, Senscient developed Enhanced Laser Diode Spectroscopy (ELDS™).

Enhanced Laser Diode Spectroscopy (ELDS™)

Enhanced Laser Diode Spectroscopy is a revolutionary gas detection technology, specifically developed for safety related applications in industry. ELDS provides the following unique benefits and advantages:

- ELDS based OPGD systems provide reliable, sensitive detection of both flammable and toxic gases at low ppm concentrations. Toxic gases of primary interest include hydrogen sulfide, hydrogen fluoride and ammonia.
- ELDS-based OPGD systems offer three orders of magnitude in increased sensitivity for hydrocarbons, greatly increasing the probability of detecting a flammable gas leak before it reaches catastrophic proportions. Current NDIR methodology fails to provide warnings early enough and reliably enough to facilitate any significant remedial action.



- ELDS based OPGD units can be produced for combinations of toxic and/or flammable gas hazards, significantly reducing the cost for a comprehensive gas detection system.
- Unique Simu-Gas™ feature provides the long sought-after ability to accomplish remote, on command, electronic functional testing of open path gas detectors either locally or from the control room. (See table of gases for complete list)

Theory of Operation Concepts

Using a separate transmitter/receiver configuration, ELDS systems detect and measure gas concentrations at specific target gas absorption wavelengths over distances of up to 200 meters. The detector measures absorbance changes along the line-of-sight path when a combustible or toxic gas passes through the beam. Enhanced Laser Diode Spectroscopy (ELDS™) utilizes highly reliable, solid-state laser diode sources similar to those used in demanding telecommunications applications. Innovative signal processing methods significantly increase sensitivity, enabling reliable detection down to fractions of a % LEL meter of combustible gases, and low ppm meter levels of toxic gases. ELDS addresses problems experienced by traditional laser diode systems including laser Relative Intensity Noise (RIN), absorption by atmospheric gases, and coherence/fringe effects. ELDS uses a combination of techniques which significantly enhance the ability of an OPGD to detect small fractional absorbancies with an extremely low false alarm rate.

ELDS techniques allow our customers to finally meet stringent regulatory and safety integrity requirements with a false-alarm free system for low level combustible and toxic gas detection.

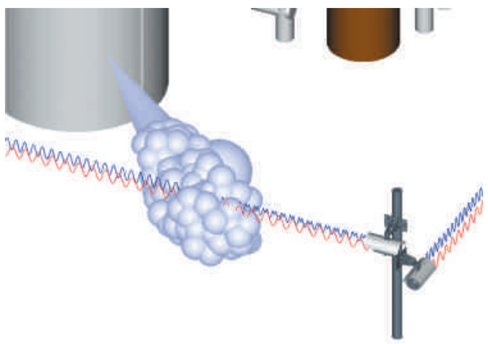
Multiple Modulation Frequencies

To successfully address system noise and the associated unacceptable false alarm rates, the ELDS technique employs Multiple Modulation Frequencies. The laser diode is driven by a current comprised of two components, a bias component and a sinusoidal wavelength modulation component. The bias component is chosen to operate the laser diode at a wavelength close to a chosen optical absorption line of the target gas. The sinusoidal component alternates between two, non-harmonically related electrical frequencies f and f^{I}. At each of the chosen frequencies, the laser's wavelength is alternately scanned across the chosen absorption line for a designated time interval.

When there is no gas present in the measurement path, the combined Fourier transform of the detector signal will look like Figure 2, with just two frequency components f and f^{I}.

When there is a substantial quantity of target gas in the monitored space, the combined Fourier transform of the detector signal will look like Figure 3, with sets of harmonics of both f and f^{I}. The probability of both measurements simultaneously suffering noise induced deviations above the alarm threshold is extremely small, lower than the targeted 1 in 100 years false alarm rate probability.

The benefits of modulation and measurement at multiple, non-harmonically related electrical frequencies are not limited to reducing the impact of inherent system noise. The use of modulation at a number of non-harmonically related frequencies also reduces the likelihood that electromagnetic interference and/or thermal noise will affect all measurement frequencies simultaneously, again enabling false alarm rates to be significantly reduced.



Harmonic Fingerprints

Although conventional Laser Diode Spectroscopy (LDS) methods of measuring gases have been in use for several years in process control and environmental monitoring applications, such systems have not been popular in safety related applications due to their high false alarm rates when detecting low levels of hazardous gases. Conventional LDS systems suffer from the combined effects of system noise, absorption by atmospheric gases and coherent interference effects, all of which can produce spurious readings and false alarms.

ELDS overcomes the false alarm problems experienced by conventional LDS systems by the use of Harmonic Fingerprints™. Using a small retained sample of target gas inside the transmitter, the temperature and wavelength modulation currents applied to the transmitter's laser diodes are actively controlled to lock the lasers such that absorption by target gas produces specific Harmonic Fingerprints. The relative amplitudes and phases of the

harmonic components in a Harmonic Fingerprint are so specific that only absorption by target gas produces a signal with the desired Harmonic Fingerprint. Noise, absorption by atmospheric gases and coherent interference effects never produce signals with the Harmonic Fingerprint, enabling an ELDS-based gas detector to effectively eliminate false alarms from these causes.

Multiple Measurement Wavelengths

It is widely understood that measuring gases with a single wavelength can be limiting to the sensitivity and accuracy of the measurement. Multiple wavelength measurement and detection, employed by scanning spectroscopy systems, has long been the technique of choice for analyzers providing low level, selective analyses of gas concentrations in the lab and on the process floor. But for ambient gas detection systems, multiple-wavelength scanning has been too complicated and too expensive to employ in the majority of applications. The Vertical Cavity Surface Emitting Lasers (VCSELs) employed in Senscient's ELDS-based gas detectors provide economic scanning of wavelength ranges of 2-3nm, enabling multiple wavelength or multiple species measurements.

Multiple Laser Diodes

Even though it is not possible to completely eliminate coherence/fringe effects from a laser diode system (especially one operating along an open measurement path) it is possible to reduce the rate of false alarms arising from such effects. The ELDS system contains two laser diodes, operating at two different wavelengths corresponding to two different absorption lines of one or more target gases. The outputs from the lasers are collimated by a common optical element, aligned such that optical radiation from both laser diodes reaches the receiver after passing through the monitored path. The optical radiation received from both laser diodes is concentrated onto a detector, at which point the optical signals are combined into a single electrical signal.

The use of multiple laser diodes and multiple measurement wavelengths is an effective way of addressing problems with coherent interference/fringe effects, a common problem experienced by conventional LDS systems. Two and even three VCSEL laser diodes can easily be mounted on a common temperature stabilized mount, sharing all of the associated optics and detectors; whilst keeping system costs reasonable.

The electrical signal from at the detector contains two sets of independent frequency components proportional to the amount of target gas present in the measurement path. These effectively independent measurements of the quantity of target gas in the monitored space can then be compared and used to confidently determine the quantity of target gas present in the monitored space, if any.

Multi-Gas Capability

The use of two lasers, scanning different wavelengths at different electrical frequencies makes it possible to treat each measurement as being completely independent of the other. Consequently, ELDS provides the opportunity to monitor two or more different target gases simultaneously in the same transmitter/receiver system. Combinations of gases that are likely to be of interest include methane + hydrogen sulfide (solution gas), butadiene + hydrogen fluoride (alkylation) and methane + methanol (methanol injection).

Increased system reliability, virtually false-alarm free low level gas detection, and even simultaneous multiple gas detection capability is now possible.

Simu-Gas

Senscient introduces the concept of Simu-Gas™ for the simplest and most reliable gas detector functionality test available.

In an ELDS system with Simu-Gas, the transmitter's microprocessor has direct control of the synthesis of the laser diode drive waveforms, and access to the Harmonic Fingerprints being produced by absorption of laser diode radiation by the retained sample of target gases.

Upon receiving a command instruction from an operator or control system, the transmitter's microprocessor adds Harmonic Fingerprint components to the laser diode drive waveforms to simulate the presence of a given quantity of target gas in the monitored space. The optical radiation leaving the transmitter then faithfully simulates the presence of target gas in the monitored path.

Cost of Ownership reduces to almost zero with this innovative technique that permits gas detector functionality to be confirmed on command, locally or remotely under any condition.

When the receiver processes the signal that it is receiving from the transmitter, it sees the Harmonic Fingerprint components and calculates and outputs the corresponding quantity of target gas. By simply comparing the gas reading output by the receiver to the quantity of target gas that the transmitter was instructed to simulate, it is possible to verify the correct operation of the gas detector.

Compared to the conventional techniques currently used to test gas detectors, Simu-Gas testing has the following advantages:

- Functional testing can be performed remotely, without operators needing to gain access to difficult-to-reach gas detectors. No more scaffolding or abseiling!
- Gas detectors can be functionally tested much more frequently, providing greater safety integrity. Simu-Gas enables SIL 2 or SIL 3 gas detection systems to be easily realised.
- There is no need for operators to carry cylinders of hazardous gases around facilities in order to test gas detectors.
- The results of detector functionality testing can be gathered and logged automatically.
- The operation and maintenance costs for a gas detection system are greatly reduced.

Cost of Ownership reduces to almost zero with this innovative technique that permits gas detector functionality to be confirmed on command, locally or remotely under any condition. IFP

ELDS: Table of Detectable Gases

Hydrogen sulphide	H_2S
Hydrogen fluoride	HF
Hydrogen chloride	HCl
Hydrogen bromide	HBr
Hydrogen iodide	HI
Hydrogen cyanide	HCN
Ammonia	NH_3
Carbon monoxide	CO
Carbon dioxide	CO_2
Oxygen	O_2
Methane	CH_4
Ethane	C_2H_6
Propane	C_3H_8
Butane	C_4H_{10}
Ethylene	C_2H_4
Propylene	C_3H_6
Acetylene	C_2H_2
Methanol	CH_3OH
VCM	C_2H_3Cl
EDC	$C_2H_4Cl_2$

Lee Richman, the founder of Senscient, is a recognised authority on infrared gas detection experienced in the design and manufacture of products using advanced electro-optic technology. Lee has been awarded or cited upon patents in the fields of gas detection, electronic warfare and video-telephony. **Jean Berthold**, the Sales and Marketing Director, is known throughout the gas detection and analysis industry with extensive experience developing promotional sales and marketing strategies and the long term development of customer relationships and the effective hiring, training and motivation of talented and capable distribution partners.

For more information contact:
jeanberthold@senscient.com
Tel. USA: 281-639-9168

What Are You Missing in Confined Space Entry Protection?

The industrial environment has changed substantially since OSHA first defined confined space entry (CSE) regulation in the late 70's, and gas detection regulation has not kept pace.

By Meg Godfrey

Technical Services Manager for RAE Systems, Inc.

The standard Four-Gas monitor is simply insufficient protection from the many – now common – toxic gases and vapors that are major constituents or by-products of modern industrial processes. Monitors that measure only O_2, LEL, CO and H_2S are letting common, devastating toxins slip through the safety net making them insufficient to the task and exposing workers, families, and communities to unnecessary illnesses and deaths.

Written specifically for sewer entries, OSHA addresses this shortcoming in gas detection in 1910.146, Appendix E:

"…where the employer has not been able to identify the specific atmospheric hazards present or potentially present in the sewer, broad range sensors are preferable because they indicate that the hazardous threshold of a class (or classes) of contaminants (i.e. hydrocarbons) in the sewer have been exceeded."

In fact, better than 80% of the gases and vapors listed in OSHA 1910 Subpart Z – Toxic and Hazardous Substances are volatile organic compounds (VOCs) or hydrocarbons. And since most are toxic long before they are combustible, they go unobserved by the standard Four-Gas monitor.

Could these lives have been saved if a PID had been used in conjunction with a standard four-gas monitor?

Two workers were poisoned while cleaning an aluminum trailer tank with a phosphoric acid solution. The tank had been used 6 months previously for the transport of a 42% solution of sodium arsenite (weed killer). Since that time it had been cleaned with steam and detergent, and used for storage and transportation of alcohol and other industrial solvents. Before assigning the trailer to another client, a thorough cleaning job was ordered, which required the hand application of the acid cleaner. Subsequently, arsine was generated by a reaction between the acid cleaner and the aluminum which had arsenic impurities.

Three contract workers died while repairing the interior rubber lining of a sodium hypochlorite tank at a waste water treatment plant. The workers were working in a confined space, using extremely toxic and flammable chemicals (toluene, xylene, methanol, isopropanol, and methyl ethyl ketone). Since the workers did not have an atmospheric gas testing instrument, the plant maintenance engineer provided one capable of detecting oxygen, flammability, and hydrogen sulfide. Two days later, the workers were found dead inside the tank. The medical examiner listed the cause of death for all three workers as toluene poisoning.

Three workmen were cleaning out a trichloroethylene degreasing tank. The tank is only cleaned out when the plant is not in operation, therefore, only the three assigned the cleaning task were in the plant. A relative of one of the workers stopped by the plant that evening and found all three workmen down in the tank and unresponsive. One was dead when removed, one died a few hours later at a local hospital, and one remained critical for a month and then died without regaining consciousness.

A 34-year-old male painter died when he apparently inhaled vapors from paint containing xylene, lost consciousness, and fell 140 feet within the vertical water supply pipe of a municipal water tower.

PIDs – Accurate, Sensitive Detection of Classes of Toxins

Photo Ionization Detectors (PID's) measure low levels – 0 to 10,000 parts-per-million – of VOCs (Volatile Organic Compounds), hydrocarbons and other classes of toxic gases. They provide compact, sensitive, accurate, affordable and reliable real-time gas monitoring of many of the common toxic gases and vapors that four gas monitors miss.

What are some common VOCs?

VOCs are the chemical compounds that keep industry going and include:

- Fuels
- Oils, Degreasers, Heat Transfer Fluids
- Solvents, Paints
- Pesticides, Herbicides
- Plastics, Resins and their precursors

VOCs are found throughout industry, from obvious applications in the petro-chemical and semiconductor industries to not-so-obvious applications such as sausage manufacturing.

Why Not Use an LEL Monitor?

Many VOC's are flammable and may be detected by the LEL (Lower Explosive Limit) or combustible gas sensors found in virtually every multigas monitor – but not necessarily before they reach toxic levels. As the following chart shows, many common VOCs and hydrocarbons present a serious toxicity hazard at concentrations considerably below their 10% LEL alarm limit.

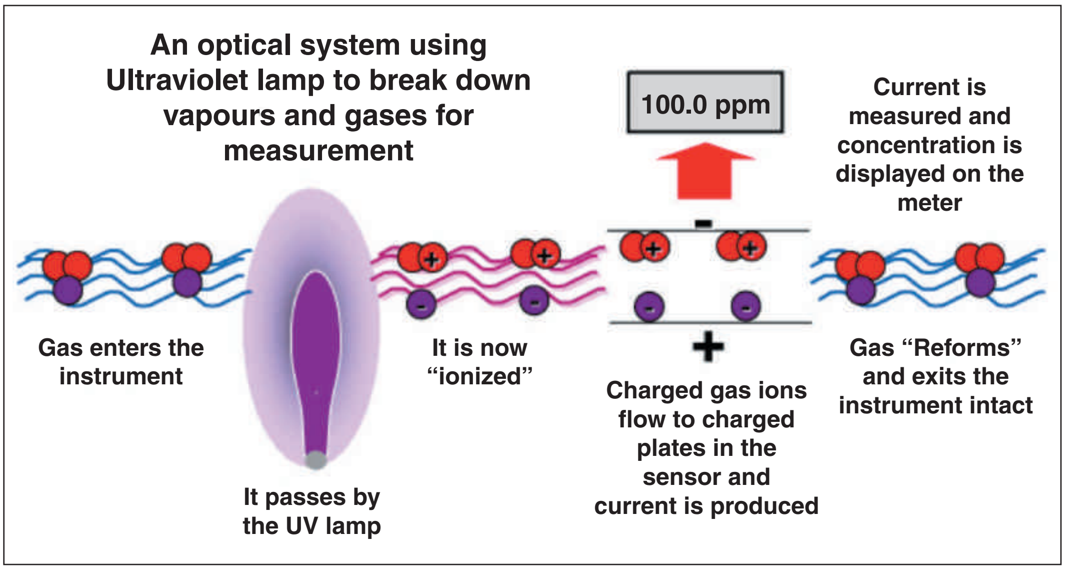
For many common compounds, TWA alarm conditions are reached at concentrations several magnitudes lower than LEL. Add to this the fact that LEL sensors typically have an accuracy of +/– 3% of the reading and it is clear that LEL sensors do not provide sufficient protection from unanticipated gaseous threats. LEL sensors measure "explosivity", not toxicity.

Measuring in Parts-Per-Million – The Maturation of Gas Monitoring

When "Four-Gas" confined space monitors first hit the safety market, the goal was to stop fatalities in confined spaces due to the acute (immediate) affects of toxic or explosive gases. Simply put, LEL sensors made sure that workers got home at night. As gas monitoring needs mature, CSE professionals are becoming increasingly concerned with the chronic (long-term) affects of many gases and vapors. Detecting at these low levels requires gas measurement tools

Compound	LEL by volume	LEL (ppm)	10% LEL (ppm)	IDLH*
Ammonia	15%	150,000	15,000	50
Arsine	5.10%	51,000	5100	0.05
Benzene	1.20%	12,000	1200	1
Diesel	0.70%	7,000	700	13
Isopropyl Alcohol (Isopropanol)	2.00%	20,000	2000	400
Methyl Ethyl Ketone	1.40%	14,000	1400	200
Styrene	0.90%	9,000	900	20[2]
Toluene	1.10%	11,000	1100	50
Trichloroethylene (TCE)	8%	8,000	800	100
Vinyl chloride	3.60%	36,000	3600	1
Xylene	1.10%	11,000	1100	100

*Immediately Dangerous to Life or Health Concentrations (**IDLH**)



that measure in parts-per-million (ppm). Measuring in ppm lets workers enjoy retirement! Used properly, a PID is the best choice to provide workers confidence in many chemical environments.

PID – Choosing "Broad-Band" over Specificity

Some say that while the PID is clearly sensitive to many toxic gases and vapors at ppm levels, its lack of selectivity reduces its usefulness. For many applications, that lack of specificity is, in fact, a life saver. CSE technicians who have the right equipment and follow the regulations are protected from the anticipated dangers – lack of oxygen, threat of combustion, hydrogen sulfide or carbon monoxide poisoning. The advantage of the PID is that it is not selective; able to detect a broad spectrum of VOCs and hydrocarbons, it is a highly portable, continuous-operation monitor that provides immediate feedback to workers concerning unseen and unanticipated threats. This lets them take control of their actions and lets them perform their job tasks with the confidence that they are not being exposed to hazardous chemicals. The PID measures continuously and results can be stored and "played-back", instantly.

PIDs Respond Instantly to Transient Exposures

Adsorbent tubes respond slowly to changes in concentration. This means that they can miss, or grossly underestimate some exposures. For example, suppose a worker's task involved periodically leaning into a degreasing machine. While leaning into the machine, the worker was exposed to 300 ppm of perchloroethelyne for 10 seconds. This quick exposure certainly has toxic affects on the worker, but the slow response of adsorptive sampling techniques, coupled with their averaging, may completely miss this practice. A PID, not only could datalog these quick, high transient responses, but can provide alarms to alert the operator to this unsafe procedure.

PID Provides Workers with Alarms

PIDs provide instantaneous alarms so that workers can take immediate action. Chemical vapor safety is no longer delivered in a disciplinary manner by an industrial hygienist; instead it is a proactive part of the workday. Adsorptive techniques are reactive rather than proactive. By the time that the data is available, the worker has already been exposed.

How does a PID work?

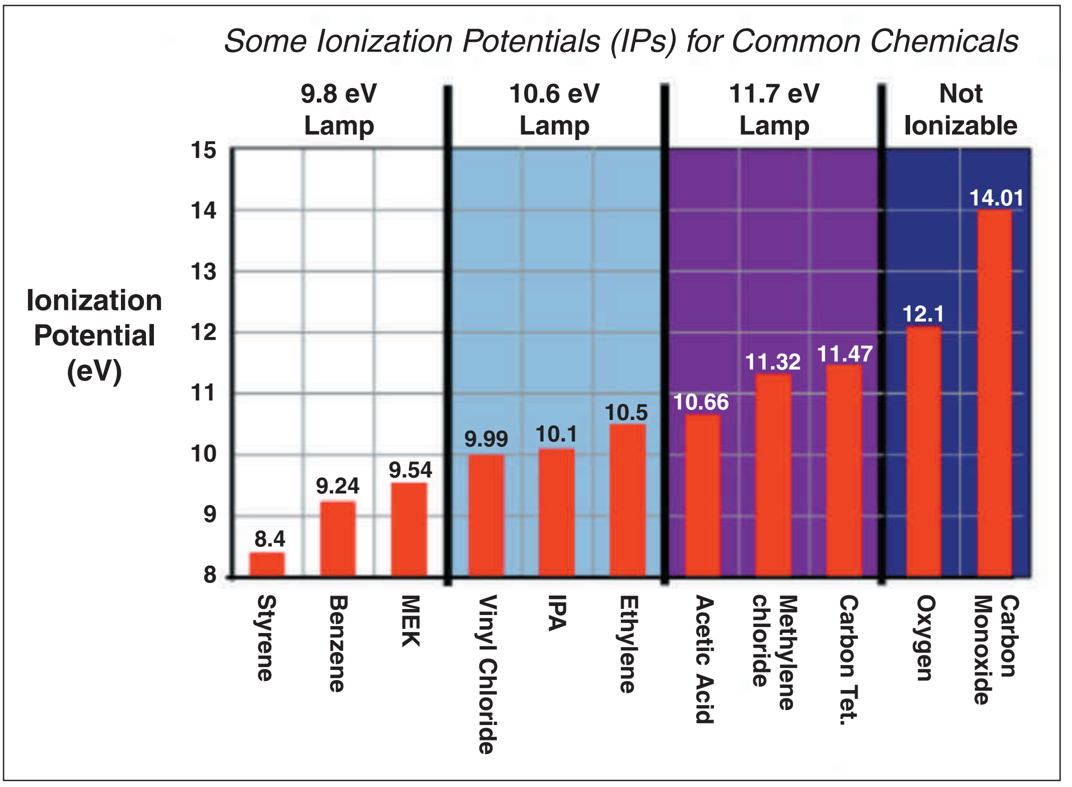
A PID uses an ultraviolet light source to break down chemicals into positive and negative ions that can easily be counted with a Detector. The detector measures the charge of the ionized gas and converts the signal into current. The current is then amplified and displayed on the meter as "ppm." After measurement the ions reform the original gas or vapor. PIDs are non-destructive; they do not "burn" or permanently alter the sample gas, which allows them to be used for sample gathering.

Monitors that measure only O_2, LEL, CO and H_2S are letting common, devastating toxins slip through the safety net making them insufficient to the task and exposing workers, families, and communities to unnecessary illnesses and deaths.

Ionization Potential

All elements and chemicals can be ionized, but they differ in the amount of energy required to cause ionization. The energy required to displace an electron and "ionize" a compound is called its Ionization Potential (IP), measured in electron volts (eV). The light energy emitted by an UV lamp is also measured in eV. If the IP of the sample gas is less than the eV output of the lamp, then the sample gas will be ionized.

IPs can be found in the NIOSH Pocket Guide, PID manufacturer literature or in many chemical texts.



What does a PID Measure?

The largest group of compounds measured by a PID are the Organics – compounds containing Carbon (C) atoms – including the following:

- **Aromatics** Compounds containing a benzene ring including benzene, toluene, ethyl benzene and xylene.
- **Ketones** and **Aldehydes** Compounds with a C=O bond including acetone, methyl ethyl ketone (MEK) and acetaldehyde.
- **Amines** and **Amides** Carbon compounds containing nitrogen, like diethylamine.
- **Chlorinated hydrocarbons** Trichloroethylene (TCE), perchloroethylene (PERC)
- **Sulfur** compounds Mercaptans, sulfides
- **Unsaturated hydrocarbons** Butadiene and isobutylene
- **Alcohols** Isopropanol (IPA) and ethanol
- **Saturated hydrocarbons** Butane and octane

PID technology, coupled with the standard Four-Gas monitor provides CSE professionals powerful, affordable, portable protection from unanticipated as well as anticipated threats.

In addition to organic compounds, PIDs can be used to measure some Inorganics. These are compounds without carbon and include:

- **Ammonia**
- **Semiconductor gases** Arsine, Phosphine
- **Hydrogen sulfide**
- **Nitric Oxide**
- **Bromine** and **Iodine**

What PIDs Do Not Measure

- Radiation
- Air (N_2, O_2, CO_2, H_2O)
- Common Toxics such as CO, HCN, SO_2
- Natural Gas (Methane, Ethane)
- Acid Gases (HCl, HF, HNO_3)
- Others- Freons, Ozone (O_3), Hydrogen peroxide
- Non-volatiles: PCBs, Greases

PIDs are a Powerful Tool!

PIDs are now capable of measurements from 0 to 10,000 ppm with resolution as low as 1 ppb (parts-per-billion). They are a powerful means of detecting and measuring VOCs and other toxic gases and vapors at concentrations far lower than LELs. PID technology, coupled with the standard Four-Gas monitor provides CSE professionals powerful, affordable, portable protection from unanticipated as well as anticipated threats. The PID's ability to provide accurate "broad band" detection of a host of common, highly toxic compounds makes it a necessity in today's modern industrial environment. IFP

A graduate in Mechanical Engineering from the University of Texas at Austin, **Meg Godfrey** is the Technical Services Manager for RAE Systems, Inc. Ms. Godfrey can be reached at mgodfrey@raesystems.com

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The 6 W's of Firest
Where, Why, When,

Pic courtesy of
Rectorseal Inc

Over the past twenty years, I have read many articles on the subject of Firestopping. Here is yet another, an editorial of sorts; but hopefully you will find at least some of the information presented valuable from your perspective within our industry. Our collective goal must be to provide the best total fire protection by maintaining a balanced approach incorporating: Detection, Compartmentation and Suppression. To that end, I will focus on Firestopping; that vital and most necessary element of Compartmentation. I will also address the 'What', 'Where', 'Why', 'When', 'Who' and '(W)How'of firestopping.

By Randy G. Clark

What is Firestopping?

(I always like to start things off with a definition.)

Firestopping is a material or a combination of materials used to reestablish the fire integrity of a rated wall or floor assembly after its rating has been compromised by the inclusion or exclusion of a penetrant or by a construction joint. To simplify, one must maintain the time rated integrity of a rated wall or floor after any change is made.

Where do you Firestop?

Fire-rated walls and floors gain their time rated fire integrity when they are constructed meeting the design to which they were originally tested and rated. In the US Market, assemblies are tested to meet the American Society for Testing and Materials, ASTM E119, "Fire Tests of Building Construction and Materials" or the equivalent Underwriters Laboratories, UL 263 or the National Fire Protection Association, NFPA 251. However, it is inevitable that these walls and floors will be penetrated by various building services such as: power and communication cables, plumbing pipes, air handling duct work, etc. It is also inevitable that there will be areas of various construction joints between these rated assemblies such as: head of wall, wall to wall, floor to floor, floor to wall, etc.

Where building services penetrate the rated assemblies (walls or floors), the assembly's rating is compromised and in order to regain the assembly's rating, the penetration must be properly sealed. To be "properly sealed", we use an appropriate System Design. A System Design is comprised of the rated assembly, the penetrant and the fill materials used to seal the opening. In the same

opping – What, Who and (W)How

way, where rated assemblies are joined one to another, the resulting construction joint must also be "properly sealed" with an appropriate System Design. The construction joint System Design must be able to maintain the rated assemblies' rating 'edge to edge'. It is this System Design which is at the heart of Firestopping.

Why must we Firestop?

The quick reason usually given is that firestopping is mandated by most building codes worldwide. The intent of the code is Life Safety in other words for the safety of the public. The intent of firestopping in maintaining the fire integrity of the rated assemblies is to save lives and reduce the damage to property. Firestopping maintains Compartmentation. When I build using fire rated assemblies and do not address the penetrations which go through those assemblies, my efforts will have been wasted since a fire will not be 'contained' and will pass through to the adjacent area. We must maintain the integrity of the time rated construction in order to impede the spreading of the fire. Compartmentation along with Detection and Suppression provides the balanced approach to Fire Protection.

We humans seem to be a 'reactive' people; we wait until something terrible happens before we make a change. The very existence of Building Codes can be viewed in this way. It can be argued that all of the existing Building Codes have at their core a Fire Code. We saw the emergence of more stringent building codes and ordinances which were often the direct result of large fires where many lives were lost. In 1875 the city of Chicago established new and more stringent building and fire code regulations as a direct result of the Great Chicago Fire of 1871. During the past century, we see other 'landmark' fires such as: Coconut Grove nightclub in Boston (1942), Browns Ferry Nuclear Plant fire in Alabama (1975) or the MGM Grand in Las Vegas (1980) to name only a few. As a result of the massive loss of life at these and other fires, the Building Codes were strengthened.

Another direct result of these landmark fires would be emergence of the Firestopping Industry. The Codes became more stringent with the recognition of the importance of sealing the penetrations. The integrity of the fire rated barriers had to be maintained by Firestopping. It was at the earlier part of the 1900's that the National Fire Protection Association (NFPA) traces the origins and development of their "Life Safety Code" (NFPA 101). NFPA's "Life Safety Code" along with their 'family' of other Codes and Test Standards have become recognized and used world wide.

With the development and enforcement of the Building and Fire Codes and the emergence of the Firestop Industry, came the need to prove compliance to those Codes. This is where recognized independent third party testing came into the

Pic courtesy of Rectorseal Inc

picture. Organizations such as Underwriters Laboratories (UL) additionally developed Test Standards for the Firestop Industry. Through their various Directories (e.g. Fire Resistance Directory) they will categorize and list System Designs specific to a manufacture and their products which will independently verify performance to those Test Standards.

As jurisdictions adopt regulations (building or fire codes) there will be a great benefit to the safety of the public. Of course, these codes and regulations will mean little unless there are also provisions for their enforcement. There must be provisions in place for proper plan submittal to the authority having jurisdiction (AHJ) for plan checking and building permit issuance. Equally, there must be routine inspections completed by the AHJ of the project under construction to insure that building Codes, Plans and Specifications are being followed. It is only after the Project has successfully passed its inspections that a Certificate of Occupancy can be issued.

When should the Firestopping take place?

In developing the timeframe during which Firestopping should occur, I must recommend that the key words here are cooperation and coordination. It is essential to have pre-construction meetings involving all players before the beginning of the project. These meetings should include representatives from each contractor, sub-contractor, construction management, project architect, building owner and the local AHJ. During these meetings there must be established a 'coordination' between the various trades as to when their respective areas will be sufficiently completed so that the final sealing (firestopping) of the services and construction joints can take place. The resulting 'cooperation' between the players should

Randy G. Clark

Randy G. Clark has been involved in the firestopping industry for over twenty-three years. His diverse background in manufacturing, his knowledge and understanding of through-penetration firestop systems, his involvement in various trade organizations – all contribute to his broad appreciation and respect for the firestopping industry. He has participated at many levels within the standards and code organizations from helping to develop and establish industry standards to the revision of the current model building codes.

The year of 1984 started Randy's introduction into the firestopping business as he was associated with a distributor of firestopping products. In being one of the early pioneers to recognize the importance of the specialization in firestop technology to the architectural, contracting and code communities, he then began the firestopping consulting firm of R.G. Clark and Associates in San Antonio, Texas in 1986.

In 1990, Randy was asked to serve as the Northeast Regional Sales Manager for the Hevi-Duty Nelson Corporation which manufactures firestopping systems in Tulsa, Oklahoma. One year later, Randy was asked to become the Manager of Technical Services for International Protective Coatings (IPC) located in Ocean Township, New Jersey, another manufacturer of firestopping materials. His firestopping responsibilities included testing, new product development, and providing technical assistance through engineered drawings, technical solutions and applications.

In 1993, he was asked to become the Manager of Technical Services at The RectorSeal Corporation in Houston, Texas. His realm of duties includes the management of the UL, certified fire test facility, assisting with new product development and overseeing the Technical Services Department. He now serves as Manager of Firestop Technologies for the International Division and serves as the OEM Sales Manager.

Randy is a very active member in the following trade organizations: National Fire Protection Association (NFPA), Southern Building Code Congress International (SBCCI), International Conference of Building Officials (ICBO), Building Officials and Code Administrators International (BOCA), Construction Specifications Institute (CSI). He is the recent past President (2 terms) for the International Firestop Council (IFC). Underwriter's Laboratory (UL) appointed Randy to be a member of their Standards Technical Panel (STP). He also participates on E-05, Fire Standards, and E-06, Performance of Buildings, subcommittees of the American Society for Testing and Materials (ASTM). In addition, he is a member on several task groups within these subcommittees developing standards for "Hose Stream", "Perimeter Joints", "Joint Treatment", and "Penetration Fire Stops".

Pic courtesy of Rectorseal Inc

enhance the project's chances of better maintaining its construction timeline and should help it to be completed within budget.

Once the building services (pipes, cables, ducts, etc.) are completed and in place, the installation of the firestop materials can occur. The contractor must take into consideration that some installations will need to be completed in stages so as to allow the AHJ to inspect before certain areas are closed up. Once the AHJ has completed their inspections, these sections of the project can be turned over to the finishers.

Who is responsible for the Firestopping?

There is a shared responsibility for firestopping. All members of the construction team: the architect, engineer, consultant, designer, construction manager, sub-contractor, manufacturer, building official, etc. have a vital part in making certain each does their best to provide for proper Life-Safety and total fire protection.

Firestopping of the penetrations is often done by the individual trade responsible for that building service. The electrical contractor will be responsible for conduits, cables and cable trays. The plumbing contractor will seal his pipe penetrations and the mechanical contractor his ducts.

During the past ten years, there has been a growth in independent firestop contractors. These specialty contractors will take responsibility for the entire project and will work with each trade to firestop each penetration and construction joint. The view of many in the industry is that by having a single source firestop contractor, the result will be a more consistent end product in both quality and conformance to the plans and specifications.

(W)How do you Firestop?

(Yes, I know that 'how' begins with an 'h'; but by adding the 'w' it makes for better alliteration in the title.)

In order to maintain the Compartmentation by the installation of firestops, we start with the site condition. We need to know a full and complete description of: the rated assembly (wall or floor), the size of the hole, the penetrant(s) (if any) and their position relative to each other and within the hole. With this information we must select an appropriate System Design which in the US Market is based on tests conducted in accordance with ASTM E814 or UL 1479, "Fire Tests of Through-Penetration Fire Stops". The System Design will provide the installer with all of the components needed to complete the seal. These components will include the type, depth and density of any backing (shuttering) material, the required depth of the specific fill material (model and manufacturer) and any other anchoring or ancillary materials required to complete the installation as per the System Design.

We must also keep in mind that not all site conditions will conform within the design limits of existing tested configurations. In those cases, a System Design will need to be developed by a manufacturer's qualified and experienced personnel. This System Design will be based on tested configurations similar to the site condition as well as additional data known concerning the performance characteristics of the various components. Since we are dealing with Life-Safety, the proposed System Design should be conservative in nature and one which can be supported by the data. As with any proposed System Design, it should be approved for use by the AHJ and by the Project's Designers/Architects before installation.

Once the individual System Design has been determined, then the installer must complete the installation as shown without variation. Upon completion, the installation should be identified by an appropriate sticker or label which provides reference to the installation date, installer, company name and System Design number or referenced Test Design. By providing this information, post installation inspections for conformance to the plans, specifications and codes will be more easily made by the AHJ or by other Project Officials.

Conclusion...

Firestopping is an essential and a necessary part of Life Safety and of the building's total Fire Protection. Firestopping is required; if not by the local Code, then it is mandated by common sense for the Safety of the Public. Firestopping will save lives. IFP

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Eradicating the water based int

Thin–film solvent based intumescent coatings have been used for the passive fire protection of structural steel since the 1970's and many millions of square meters of steel have been protected in this way. In contrast, water based intumescent coatings, first developed in the late 1980s and introduced commercially in the 1990s, have experienced a rapid growth in use around the world and thus, are now displacing solvent based products on many projects.

By John Swindlehurst

International Sales Director, Cafco International

This is not surprising, since there are a number of major benefits that apply to all water based products and some that are unique to individual products. It is, however, important to note that while water based products tend to get labelled as one generic group, many different formulations exist. Each product must, therefore, be considered separately in terms of its technical ability.

Unfortunately in some areas, particularly Asia and the Middle East, a number of myths and rumours have circulated regarding water based intumescents. Many have come about through general ignorance and misinformation, sometimes promoted by the manufacturers of solvent based products. Such myths include poor resistance to humidity, slow drying, lack of film build and reduced long term durability.

The fact is, that thousands of tons of steel have been successfully fire protected with water based intumescents during the past 10-15 years and many contractors, engineers, architects and building owners have realised the benefits of using these products.

Early water based formulations were generally restricted to 1 hour fire ratings and this limited their use. Where they were suitable, however, they provided a fast and cost-effective method of fire protection. Many steel sections required less than 0.5 mm dry film thickness and this could be applied in a single spray application. This enabled the applicator to complete the work in a very short period, thus reducing the overall construction program.

In the late 1990s water based technology improved and products became available that were able to achieve 2 hour fire ratings and even some, limited, 3 hour options. One of these products was Cafco SprayFilm WB3 and the benefits it proffered had particular relevance to the environment experienced in Asia and the Middle East.

Safer to use

Clearly two of the main benefits of water based products are safety during application and the fact that they are more environmentally friendly. Water based products contain no hydrocarbon solvents and can therefore be used safely alongside other trades and workmen. There is no possibility of solvent build up in confined spaces, no requirement for special flammable storage areas, which is especially important at the present time.

myths about umescents

Faster drying times

In high ambient temperatures experienced in Asia and the Middle East, water based products will dry much faster than solvent based products. They dry by rapid evaporation of water from within the total coating layer and therefore achieve 'through drying' much faster without the formation of a surface skin.

Solvent based products, on the other hand, tend to surface-dry very quickly. Unfortunately, this process forms a hard surface skin which then slows down the escape of solvent from the rest of the coating layer. This causes the coating to remain soft for a much longer period, thus increasing the risk of incidental damage, as well as extending the over-coating interval. The problem is compounded as higher coating thicknesses are applied.

Higher build capability

It is also possible to apply water based intumescents, such as Cafco SprayFilm WB3, at high film thicknesses in one application. Because they do not skin over when drying, the high wet film thickness does not impede the through drying of the film. Since much higher thicknesses can be applied for each coat, the overall number of coats can be reduced, thus saving construction time.

Reduced over-coating intervals

As water based intumescents dry faster, over-coating times can be reduced both for second coats and for the final top-coating. This is particularly beneficial when multi coat systems are specified. As the water based coating through-dries much faster, there is much less chance of trapping any water in the film after the topcoat is applied.

It is a common problem with solvent based intumescents that, if top-coated before all the solvent has been released from the film, bubbling and blistering can occur later as the solvent tries to evaporate through the topcoat.

Resistance to humidity

Despite rumours to the contrary, water based intumescents such as Cafco SprayFilm WB3, can withstand high humidity levels during application. Obviously, direct rain or water immersion during application or drying will affect the coating, but the solvent based intumescents are affected in the same way if they are not fully dry. Water based intumescents already contain water and as such, they are more compatible with humidity in the atmosphere.

Water based intumescents will also tolerate a small amount of moisture on the substrate as this is absorbed into the coating and then evaporates during the normal drying process. With solvent based intumescents it is essential that they are applied to a dry substrate during application. If

any moisture is present on the steel, it will form an incompatible layer between the substrate and the coating leading to loss of adhesion.

Good weather-ability

Once applied and top-coated with an approved finish, water based intumescents such as Cafco SprayFilm WB3 are able to provide good long term durability.

Although generally intended for interior use, water based intumescents have to be capable of withstanding all the environmental conditions encountered during the construction phase of a project. Experience has shown that products such as Cafco SprayFilm WB3 can be applied at an early stage of construction, without affecting the long term durability of the coating system. This practical experience is backed up by laboratory testing to international standards in both the USA and Singapore.

In Singapore, Cafco SprayFilm WB3 has passed all the requirements of BS 8202: Part 2 1992 and is the only water based intumescent listed under the Product Listing Scheme (PSB). The BS 8202 test program includes exposure to a number of different environments and conditions including humidity, washing, sulphur dioxide, heat and natural exposure. After exposure to the above conditions, each section is fire tested to ensure it can still provide the expected performance.

It can be seen from the above that water based products such as Cafco SprayFilm WB3 can offer a number of tangible benefits over solvent based products, especially in hot climates. As with any specialist material, however, it is important that the products are applied in accordance with the specifications and application instructions provided by the manufacturer. Experienced and recognised applicators should always be used as they have the knowledge and technical ability to ensure a successful project. IFP

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Draupner Oil Platform. Pic courtesy of Statoil – www.statoil.com

Offshore oil platform fire protection

By Sam Dawoud

Consultant for Rolf Jensen & Associates, Inc.

An offshore oil platform is a large structure used to house workers and machinery needed to drill and then produce oil and natural gas in the ocean or large body of water. These platforms may be attached to the ocean/sea floor, consist of artificial island or be floating.

Generally, oil platforms are located on the continental shelf, however as technology advances, drilling and production in deeper waters become more feasible.

A typical platform may have around 30 wellheads located on the platform with directional drilling allowing access to reservoirs at different depths and locations up to 5 miles (8 kilometers) from the platform. Many platforms also have remote wellheads attached by umbilical connections, these may be single wells or a manifold center for multiple wells.

Platforms types

Offshore platforms are some of the largest moveable man-made structures in the world. There are several distinct types of platforms and rigs:

- *Fixed platforms,* built on concrete or steel legs anchored directly onto the seabed, supporting the deck with enough space for drilling rigs, production facilities and crew quarters. Fixed platforms are economically feasible for installation in water depths up to 1,700 feet (520 m).
- *Compliant Towers,* consist of narrow, flexible towers and a piled foundation supporting a conventional deck for drilling and production operations. They are typically used in water depths ranging from 1,500 to 3,000 feet (450 to 900 m)
- *Semi-submersible Platforms,* having legs of sufficient buoyancy to cause the structure to float, but of weight sufficient to keep the structure upright. They can be moved from one location to another and can be ballasted up or down by altering the amount of flooding in buoyancy tanks. They are normally anchored by cable anchors during drilling operations.

  They are normally used in depths ranging from 600 to 6,000 feet (180 to 1,800 m).

Kristin Oil Platform. Pic courtesy of Statoil – www.statoil.com

- *Jack-up Platforms,* these platforms are jacked up above the sea by dint of legs that can be lowered like jacks. They are used in relatively low depths.
- *Drillships,* are maritime vessels that have been fitted with drilling apparatus. They are often used for exploratory drilling of new oil or gas wells in deep waters.

  Larger ships can be equipped with processing facilities and moored to a specific location for long period of time and are referred to as floating production systems.
- *Tension-leg platforms (TLP),* are floating rigs that are tethered to the seabed in a manner that eliminates most vertical movement of the structure. They are used in depths up to 6,000 feet (2,000 m).
- *Spar platforms,* they are moored to the seabed like TLP but unlike TLP which has vertical tension tethers, they have more conventional mooring lines.

Fire risk at offshore platforms

The fire hazards and risk for all types of platforms are similar since they all share the same type of operations. Fires that can occur on offshore platforms are:

1 Jet fires.
2 Pool Fires.
3 Running liquids fires.
4 Flash fires.
5 Fireballs.
6 Well blowout fires.
7 Gas Pool fires.
8 Confined and unconfined fires.
9 Fuel and ventilation-controlled fires.
10 Fires on the open deck within a module or on the open sea.
11 Fires involving ordinary combustibles.

Fire safety measures at offshore platforms

Because of their remote locations far from shore and the continuous presence of highly volatile substances in hostile environment, the fire protection systems & equipment and training standards for emergency response teams will have to be flawless. For the purpose of determining fire protection requirements, these platforms are divided into two areas:

- Production areas: Areas with potential for hydrocarbon fire.
- Control areas: Areas with telecommunications, data processing and control equipment including crew living HQ.

Fire Prevention measures

The first line of defense against fires is to prevent fire from happening in the first place. This could be accomplished through several measures. Some of which are:

- Proper design of structures and fire resistant construction materials.
- Using the proper processes and operations.
- Performing proper periodic maintenance of structural elements.

- Administrative controls of:
  - * Ignition sources (electric sparks, mechanical sparks, static electrical sparks, flames, hot surfaces, radiation heat, chemical reactions and high energy radiations/microwaves/radio frequencies (RF)).
  - * Hot work (welding operations).
  - * Transient combustible materials (for maintenance activities).

Fire Protection Features

There are several measures in place to protect the platforms and the crew from the consequences and impact of potential fires:

a Passive features

Passive Fire Protection (PFP) features are those permanent features that do not require manual or automatic activation, they are intended to prevent fires from propagating from one area to another, provide structural integrity for the platform, protect safety systems and equipment, protect the crew from fire, smoke and heat and provide safe passage for evacuation following potential fire events. This can be accomplished through compartmentalization, establishing fire separation (walls/barriers), spatial separation and providing structural elements with proper coating, cladding that will provide thermal protection and restrict heat transmission rate from surrounding areas to the protected area.

b Active Features

Active Fire Protection features are activated either automatically or manually. They are intended for fast/early detection (of gas leakage or fires) and control/extinguishing of potential fires:

1 *Fire & Gas detection:* Gas detection systems at oil platforms are designed for early detection of gas leakage and potential hazardous situation. Both Infra Red (IR) and line-of-sight or point type detectors are used for this purpose. Flame, Smoke and heat detectors are also used in different areas of the platform depending on the potential fire hazards in these areas.

2 *Fire Suppression systems:* These systems are intended to extinguish fires either manually or automatically (depending on the potential fire hazard and the area under consideration):

a Water based systems:

- For Drilling, Production and Processing areas, water deluge and fixed water monitors are used.
- For spaces containing machinery and other fired equipment/processes where liquid fires are anticipated, high expansion foam or water mist systems can be used.
- For accommodation, service and working spaces, where fire growth is relatively slow, sprinkler systems and portable extinguishers are used.

b Gas based systems:

Those systems are installed in areas where water discharge can cause damage to the contents of protected area. Clean Agents (Halon replacements) are used in these areas (mainly telecommunications, data processing and control areas).

Asgard B Oil Platform. Pic courtesy of Statoil – www.statoil.com

Fire Mitigation Measures

These measures intended to mitigate effects of potential fires and include the responding fire brigade and the installation of fire and blast barriers to prevent damage to equipment.

Applicable codes for fire protection at offshore oil platforms

There are several codes, standards, directives and recommended practices by different organizations that deal with the fire hazards, safety measures and fire protection systems at offshore installations, some of which are:

- *Health & Safety Executive (HSE) Offshore Division (OSD): Fire and Explosion Strategy Issue 1.*
- *International Maritime Organization (IMO): Code for the Construction and Equipment of Mobile Offshore Drilling Units.*
- *American Petroleum Institute Recommended Practice (API-RP): 14C, 14G, 14J and 75.*
- *National Fire Protection Association (NFPA) Codes: 13,14,15,20,25,101 and 750.*

Conclusion

Offshore oil platforms are basically a stand alone/self contained installations in the ocean far from shore and any outside support/intervention and protecting them from fires is very challenging as almost every part of these structures requires protection from fire, heat and smoke in addition to the fact that all fire protection features and systems will have to operate/be installed in a very harsh and corrosive environment, they have to be extremely reliable yet they have to be easy to maintain. Fire fighting crew have to be in top physical shape with their equipment in top operating condition at all times.

As a result of the increased demand for oil on a global basis there is an increased demand for exploration and production from greater depths in the oceans and new larger platforms will have to be built with more emphasis on the safety from fires. Ideally, the fire protection issues will have to be considered/addressed from early stages of the design phase using up-to-date technology (latest analyses techniques of Process Hazard Analysis (PHA), HAZard & OPerability (HAZOP) and the fire protection professionals have to be involved for the lifelong of these platforms. IFP

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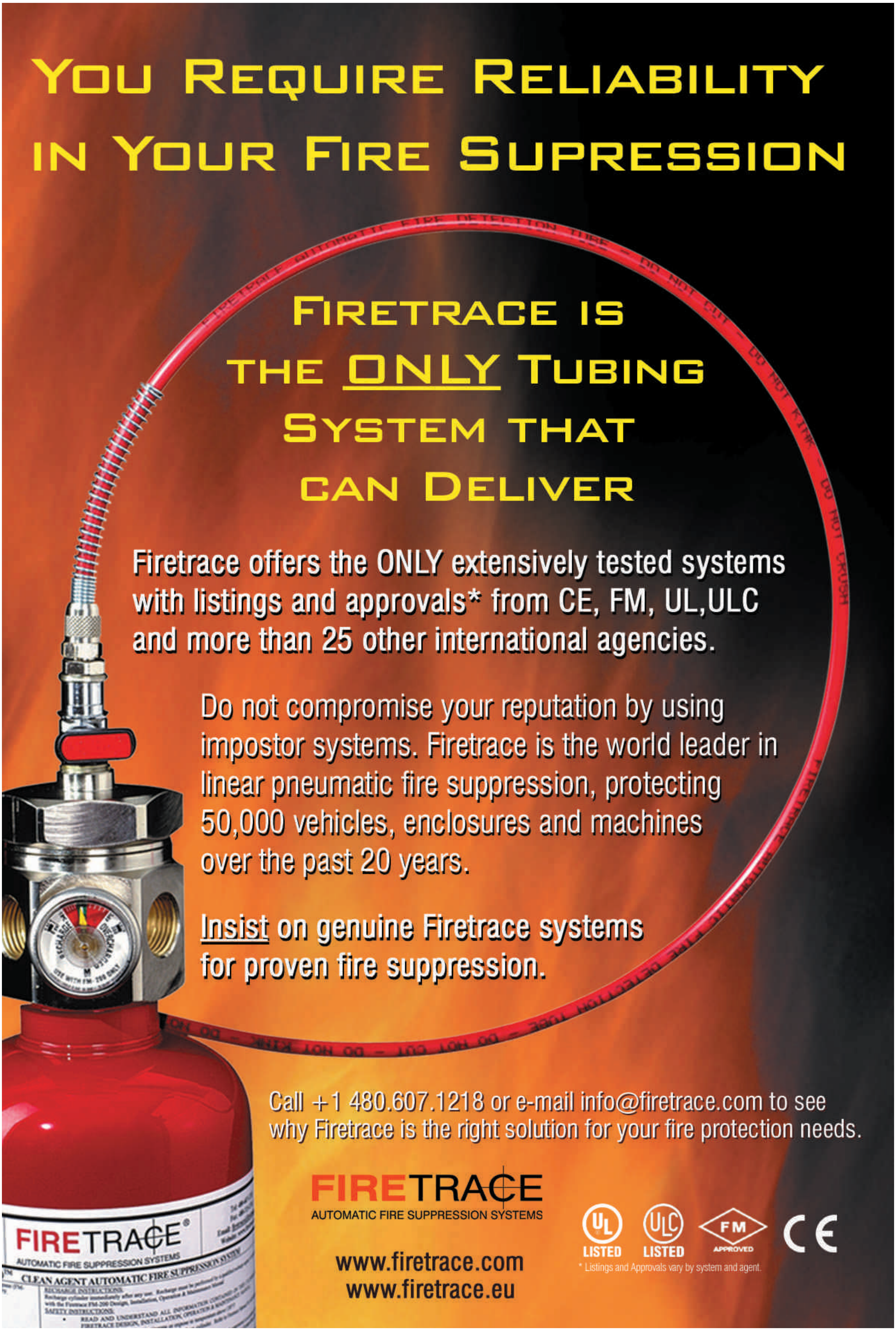
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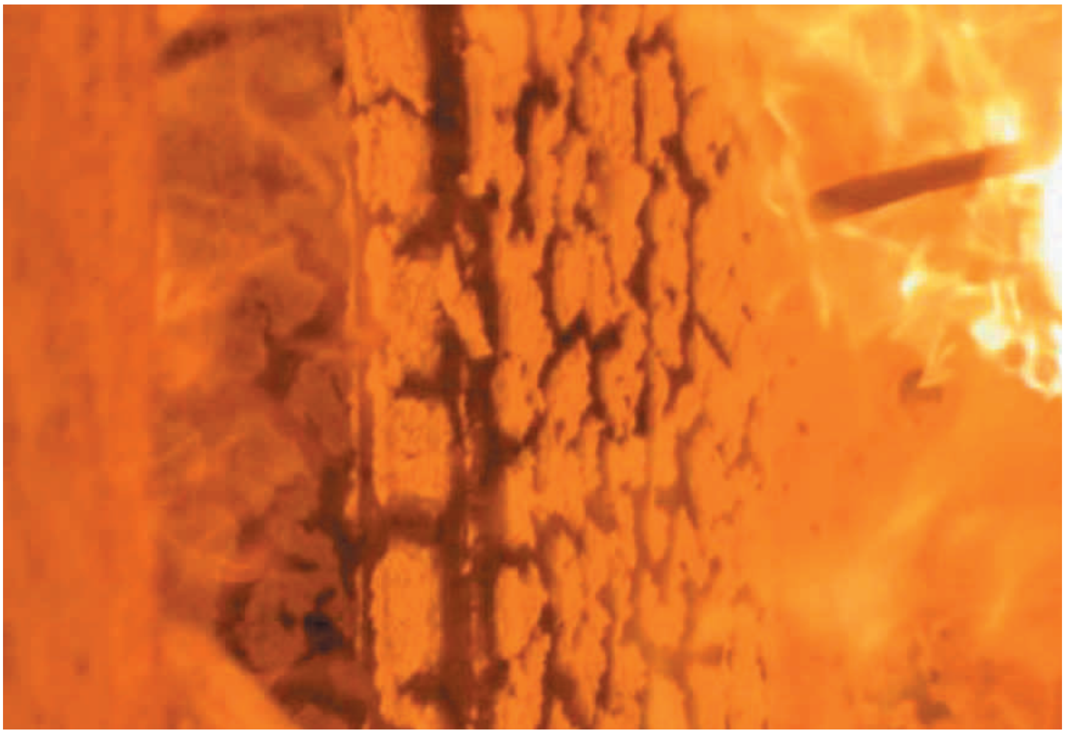
Steel column coated with intumescent in test furnace



Fire Protection of Structural Steelwork Using Intumescent Coatings

What happens to steel in fire?

In many parts of the world, structural steel is the first choice of architects and engineers for the framework of single and multi-story buildings for a number of reasons; steel offers maximum design flexibility and is widely used as an architectural feature in its own right.

By Dr Bill Allen

Director of Innovation, Leighs Paints

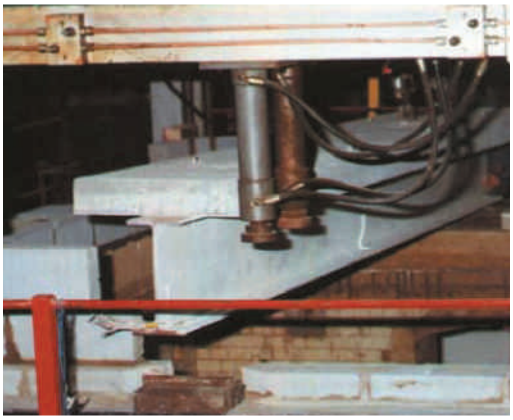
Intumescent coatings provide fire protection, corrosion protection and decoration – the ideal solution to satisfy both architect and specifier.

The combined use of steel construction methods and the use of intumescent fire protection have proved the most cost effective and reliable in many construction projects. Alternative construction materials such as concrete can lead to slower erection sequences and heavier foundations.

In a fire situation, a steel-frame building designed to maximum permissible design stress in accordance with BS 5950 Part 8 and Eurocode 4, the steelwork will rapidly lose its structural strength at temperatures in excess of 550°C.

By using insulating materials such as intumescent coatings, the rate at which steel heats can be greatly reduce, thus extending the time taken for the steel to reach its critical temperature. The

Steel beam before fire test



primary objective being the prevention of structural collapse, which in turn will provide adequate means of escape for the occupants and ensure the safety of rescue services.

Approved Document B – Fire Safety

Fire protection has now become an essential requirement of steel construction and in most countries; the Building Regulations (or equivalent) specify periods of fire resistance, depending on the height and function of the building. These fire resistance periods can vary depending on whether or not the building is protected by sprinklers or other 'active' methods of fire protection.

Approved Document B states "The building shall be designed and constructed such that, in the event of a fire, it will maintain its stability for a reasonable period".

The required periods of fire resistance are frequently listed in a tabular format relating periods of fire resistance to building height and type of occupancy although other factors such as compartmentation need to be considered.

It is important to note that the Building Regulations, Approved Document B – Fire Safety is only concerned with safety of life, and insurers may require further measures to protect property as well.

How Intumescent Coatings Work

Intumescent coatings are normally applied by airless spray to provide a smooth decorative finish and in some cases can be an integral design feature. The coatings are designed to remain stable at ambient temperatures.

The composition of intumescent coatings is based on organic resin binders, which are typically acrylated rubber or epoxy. The resins are filled with active ingredients, which react in a fire at temperatures around 250°C to form a thermally insulating carbonaceous char or foam. The char can be expanded up to 50 times the original coating thickness. The char reduces the rate of heating of the steel and hence prolongs its load bearing capacity.

The basic formulation of an intumescent comprises a number of different elements: an organic binder; a carbonific; usually a penta or dipentaerythritol; a spumific or blowing agent which could be melamine or a melamine formaldehyde derivative; a source of an acid catalyst such as ammonium polyphosphate or boric acid and finally a char reinforcement pigment such as glass flake or micro spheres.

As the temperature rises causing the binder to melt, the blowing agent liberates gases causing a controlled expansion. At the same time there is degradation of the carbon backbone and fusion of the inorganic reinforcing materials, resulting in char solidification.

Steel beam after fire test

Structural Steel

The fire resistance of an element of a steel structure is determined by its size, shape, orientation, applied forces, the core temperature, and the perimeter exposed to the fire.

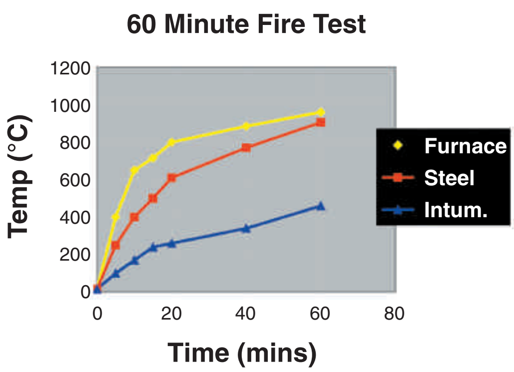
In the United Kingdom, the performance of fire protected structural steelwork is assessed using BS476: Part 21. The test method includes procedures for both flexural and compression members (beams and columns). In addition, there is now a European Standard, ENV 13381-4 (which is currently in a state of revision for intumescent coatings), which seeks to harmonise the method of test and assessment between member States.

For the purpose of loaded fire testing, generally, the maximum design force is applied to the steel member as determined by BS5950 Part 8. For beams the load is applied via hydraulic rams through a concrete slab to simulate steel beams supporting a concrete floor. This is generally referred to as 3-sided exposure because the concrete is protecting the upper face of the beam from exposure to fire.

The steel beam section is deemed to have failed when it can no longer support its design load. The Fire Resistance of the section is the time taken for the deflection in the centre of the section to reach Exposed Length divided by 30 (this is normally 150 mm) or when the rate of deflection exceeds the safety limit given in BS476 Part 20.

The graph below shows the BS476: Part 20 heating curve and the rate of heating of a steel beam both unprotected and protected with a 60-minute thickness of intumescent coating.

In the column test, the exposed length of steel



section is typically 3 metres long and all faces of the column are exposed to the fire. The load is applied vertically via a hydraulic ram exerting compression forces to the column. This is generally referred to as 4-sided exposure.

The steel column section is deemed to have failed when it can no longer support its design load, and this is generally when the column, whose expansion in the fire has been accurately monitored, has been compressed back to its original length. The temperature at which this occurs is the critical steel temperature and the time taken to reach that temperature is the fire resistance of the section.

Full scale loaded fire tests on beams are essential to provide information on insulation and stickability properties of Intumescent coatings at their maximum applied thickness. These tests must be carried out at UKAS (or equivalent) approved laboratories. The Fire Resistance achieved is only applicable to the particular section under test for the known thickness of the Intumescent Coating System applied.

In some fire test programmes the loaded column test may be replaced by a similar but unloaded tall column to determine whether the intumescent material slumps in the vertical plane. This is one option given in ENV 13381-4.

Full scale loaded fire tests on beams are essential to provide information on insulation and stickability properties of Intumescent coatings at their maximum applied thickness.

It becomes cost prohibitive and certainly not a very practical proposition to carry out the full scale testing of all sizes and shapes of steel in every orientation at a selection of coating thickness. It therefore became desirable to devise a programme of exploratory tests to enable the performance of intumescent coating systems to be assessed on a selected range of beam and column sizes. The variables explored in an assessment approach are Section Factor (Hp/A see later explanation), protection thickness and the fire resistance time to reach 550°C for columns and 620°C for beams.

A typical fire test assessment package would include at least 2 loaded beam tests, a loaded or tall column test and several unloaded indicative sections about 1 metre in length, comprising a mixture of beams and columns of different section sizes.

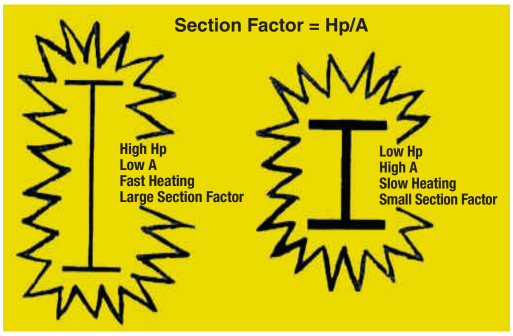
N.B. A separate test programme and assessment is required for circular and rectangular hollow sections.

If the material is subjected to the ENV 13381-4 method of test and assessment, all sections sizes to be tested are contained within the test procedure.

Selection of Fire Protection Levels

The structural strength of a steel beam or column is directly related to its mass and dimensions. Lightweight sections heat up faster and require more fire protection than heavy sections for the same period of fire resistance.

The amount of fire protection required depends



Section Factor (HpA)

Hp – The perimeter of section exposed to fire, i.e. heated perimeter (metres) and,
A – The cross-sectional area of the steel member (metres squared).
Section Factor = Hp/A (m^{-1})

on the Hp/A (Section Factor) of the steel, which is the heated perimeter exposed to fire conditions divided by the cross sectional area of the steel. ENV 13381-4 refers to this as A/V rather than Hp/A but the values are the same.

In the UK the major source of information on fire protection thickness is the ASFP (Association of Specialist Fire Protection) Yellow Book.

In calculating Hp/A values, the full cross-sectional area (A) is used irrespective of whether 1, 2, 3 or all 4 sides of the section are exposed. Assessment of fire test data for entry into the Yellow Book follows agreed guidelines given by the ASFP, for example the maximum thickness of intumescent specified for application to beams cannot exceed that tested on a loaded beam by more than 10%. The reason for this is that reactive materials generally fail by detaching from the bottom flange of beams at high thickness, particularly when under flexural loading conditions.

The Yellow Book gives tabulated thickness data for assessed products in Hp/A ranges depending on the period of fire resistance specified.

The ASFP Technical Review Panel carries out the product assessments and peer reviews for the Yellow Book. The panel includes representatives from WFRC and BRE; two of the UK's UKAS approved test laboratories.

The Yellow Book is well established in the UK and is given recognition in Building Regulation's Approved Document B as a reliable source of information when specifying fire protection thickness.

What does the future hold for intumescent coatings?

In the next few years there will be a transition from BS476 Part 21 testing to ENV 13381-4. This will be followed by ETA (European Technical Approval) leading to the CE Marking of Intumescent Coatings.

The latter is currently undergoing a great deal of discussion and is at present not deemed to be mandatory in the UK.

Improved coating technology, use of cellular beams and off-site application has seen a rapid growth in the use of intumescent coatings in recent years.

Further enhancements in rapid drying, durability and new, patented products will see this growth escalate further in the years to come. IFP

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Storage Tank Fire P

Large-scale oil and petrochemical storage tank fires are rare. However, they potentially represent major fire risks, with a massive challenge for firefighters, oil companies and the environment. Here, Peter Kristenson, EMEA Product Manager for foam products with Tyco Safety Products Fire Suppression Group, reviews current thinking.

By Peter Kristenson

EMEA Product Manager, for foam products with Tyco Safety Products Fire Suppression Group

There are only two ways to combat a storage tank fire. The first option, to let it self-extinguish by leaving the fire to burn out, is clearly not an acceptable solution. It would result in a fire that would continue blazing for several days and possibly weeks; end only with the complete loss of the stored product; and cause untold environmental damage. Burning out also calls for a major cooling operation to stop the fire from spreading to adjacent tanks and nearby structures. The second, and far more effective and acceptable option, is to actively extinguish the fire. This can be achieved only by using firefighting foams.

But what is the scale of the storage tank fire protection problem? According to a study undertaken a couple of years ago by SP Sveriges Provnings och Forskningsinstitut – the SP Swedish National Testing and Research Institute – between 1951 and 2003 there were 480 tank fires worldwide that the Institute classified as "major incidents". That is between 15 and 20 fires a year; an average of more than one every month. These incidents varied considerably, from a rim-seal fire that was extinguished without too much difficulty, to a major conflagration that engulfed a complete tank storage facility with 30 to 40 burning tanks.

So, not by chance is the oil and gas industry's workforce probably among the best trained of any industry when it comes to fire safety, and

rotection

companies are to be commended for the way in which commercial competition is put aside where fire safety issues are concerned. This is evidenced by the coordinating work of such organisations as the UK's JOIFF [Joint Oil and Industry Fire Federation]. Also, production, processing and storage facilities are constructed with meticulous care, and with painstaking attention to fire safety. However, when a fire does occur, firefighting systems are tested to the limit, as was so dramatically demonstrated during the Buncefield oil storage facility fire in the UK, which was the largest fire in Europe since the end of the Second World War.

So, the industry's attention has focused on the need for increased vigilance, the implementation of proven "best practice", and the utilisation of the most effective fire safety measures. The need to adopt a broader, strategic approach to foam stocks and the development of closer working relationships between the petrochemicals industry and those companies best positioned to offer expert advice and deliver integrated agent and delivery solutions is now firmly on the agenda.

Globally proven foam generation technology

Fixed foam systems are undoubtedly the best method of protection, as they do not require massive emergency marshalling and deployment of equipment and manpower. Naturally though, the type of system selected depends on the tank structure and its contents. Mobile trailer-mounted monitors are often used as back-up for fixed foam systems, protecting the tank itself or the bund surrounding it. Plus, with the trend in building increasingly larger floating roof tanks, large-capacity monitor trailers are now also being adopted as primary firefighting solutions.

The first truly reliable storage tank fire protection solution was the SKUM™ brand system developed in 1949. Since then, SKUM has gone on to develop systems for: cone roof and fixed roof tanks; open-top floating roof tanks; covered floating roof tanks; and horizontal tanks.

Foam generators used in fixed or "over-the-top" systems have proved highly successful and can provide storage farm operators with a cost effective and reliable solution. However, an explosion may well result in significant damage to the tank structure, seriously inhibiting the foam generator's effectiveness. This risk, together with maintenance issues, has lead to the more widespread use of less vulnerable sub-surface injection systems in situations where there is sufficient water pressure available for their use.

Sub-surface injection of foam into a storage tank is, as the name implies, where foam is injected near the bottom of a tank through a separate foam line; the foam then floats to the surface to spread and extinguish the fire. However, this method is not suitable for use with polar solvents – even where alcohol-resistant concentrates are used – because the fuel destroys the foam. So, extreme care must be taken to ensure that the sub-surface injection technique is not used on gasoline blends that contain alcohol or other polar solvent additives as oxygenates.

Sub-surface injection also cannot be used on cone roof tanks with internal floaters, in accordance with NFPA 11 – Standard for Low, Medium and High-expansion Foams. To overcome this problem, the so-called semi-subsurface injection technique has all of the benefits of sub-surface injection, and can be used for all types of fuel. The semi-subsurface technique uses a flexible hose that is filled with foam under pressure. This hose floats from the base of the tank to the surface when the system is activated, to deliver the foam to the surface. This technique is listed by the NFPA [National Fire Protection Association] as being successfully installed in more than 60 countries around the world.

Fixed monitors are though a cost effective method of protecting relatively small storage tanks and associated spill or ground fires. Remotely operated monitors with electrical or hydraulic control systems enable firefighters to remain at a safe distance from the incident. Although monitors have been used successfully for extinguishing fires in larger diameter tanks, using high-flow devices and large diameter fire hoses, monitors should not – in accordance with NFPA 11 – be considered as primary protection for larger cone roof tanks with diameters in excess of 18 metres.

Fixed systems are now more frequently used for floating roof tanks than was once the accepted

practice, where foam pourers are used to protect the rim seal area, with the foam being contained by a foam dam. SKUM has developed specialised equipment for these applications. However, good foam fluidity is essential to ensure that rapid coverage is achieved, and some oil companies have adopted a "belt-and-braces" approach and installed both foam pourers and sub-surface systems on covered floating roof tanks.

Horizontal tanks have been known to rupture

following an explosion, so it is necessary to ensure that the bund area is adequately protected. Fixed low or medium-expansion generators can be used to create an effective foam blanket, even over larger bund areas in major tank farms, and any residual fuel in the tank can be protected using a monitor. In reality, monitors can be used to protect the bund area, but this results in much higher foam consumption. At least two monitors are recommended to protect larger bunds to ensure full coverage and effectiveness of the firefighting equipment in all wind conditions.

Market-leading monitor options

SKUM has developed a wide range of monitors with delivery capabilities that span from 1,000 litres-a-minute up to more than 20,000 litres-a-minute. The latest of these FJM monitors can be remotely controlled, and are compact and lightweight, with exceptional throw performance. Any FJM monitor can be installed on a trailer to suit the precise site parameters and fire risks.

Welded stainless steel construction minimises maintenance requirements and allows FJM monitors to be deployed even in the harshest and most corrosive environments. A patented stainless steel slide-bearing system prevents unwanted movement or swinging of the monitors, while versatile nozzle patterns can be deployed in a solid jet or fog spray pattern using either water or foam.

Vapour suppression and spill protection

Vapour suppression is a major consideration when storing flammable liquids, toxic chemicals and LNG (Liquefied Natural Gas).

Again, foam is the ideal medium and has been used with considerable success for many years to cover un-ignited spills, helping to ensure that ignition does not occur. Standard practice is to use the foam system that has been installed for firefighting, the best being fluoroprotein-based foams or multi-purpose foams that must always be used if covering water soluble fuels. If used at medium-expansion rates, multi-purpose foams are particularly effective because they engulf the spill in a deep layer of stable foam bubbles that is not easily affected by wind.

Toxic chemicals, such as chlorine and ammonia, are also stored in bulk and pose a significant hazard if spilled, even into a containment area. Toxic vapour clouds can spread that represent a sizable contamination risk and, depending on the product's reactivity, either conventional firefighting foams or specialist concentrates can be applied. Again, medium-expansion foam is the most effective solution with a layer of at least 0.5 metres being applied within three to four minutes.

Foam has been found to be particularly suitable as a vapour suppressant on LNG spills, and the American Gas Association, British Gas and Gaz de France have conducted extensive trials to evaluate the effectiveness of high-expansion foam. These tests have also demonstrated that high-expansion foam can contribute greatly to the control of LNG spill fires.

Spills should, where possible, be contained within adequate drainage systems to prevent their spreading. These drainage systems can be so complex that firefighting with portable equipment may put fire fighters at risk, so fixed monitors are often used that incorporate supplementary hose lines to extinguish any small remaining pockets of fire. IFP

Let's have some joine protection – the Gover

In order to achieve the most cost-effective fire safe buildings in the UK, the Association for Specialist Fire Protection (ASFP) believes that much time and money could be saved if there was more 'joined up thinking' in the way that fire protection systems are specified, installed and maintained.

By The Association for Specialist Fire Protection (ASFP)

To this end, the ASFP is throwing down the gauntlet to bodies such as those representing building control officers, approved inspectors, the fire and rescue services, architects, fire safety engineers, structural engineers, clients, suppliers, main contractors, installers and certification bodies to come together in a constructive manner to form a 'Structural Fire Protection Forum' in order to develop best practice for the fire protection sector.

But why is such a group needed?

Well, in the opinion of the ASFP, the way in which buildings are constructed can have a profound affect on the quality and thereby the performance, of their fire safety systems. Essentially four different procurement techniques are used to construct commercial buildings, namely traditional design, management contracting, design and build and 'Public Private Partnerships' (PPP) and the 'Private Finance Initiative' (PFI).

The traditional designer process sees the client or developer appoint an architect in the early stages of the project in order to seek planning consent for the building and to produce designs and specifications according to the regulations and the client needs. Generally the architectural team will seek assistance from specialists such as structural or environmental engineers and quantity surveyors to produce a 'Bill of Quantities' and specification for the project. A tender for the work will be issued and a 'Main Contractor' appointed. Specialist sub-contractors will be sought for 'packages' of work and during construction the whole project will be supervised by the design team, led by the architect who has the overall responsibility for ensuring that the building satisfies the brief originally agreed with the client. Thus, in this case the client and the architect have the majority of the control over the type of fire protection chosen and over the applicators that are selected for its installation.

In the management contracting process system, it is the management contractor/construction manager who takes responsibility for delivering the construction of the project. This type of procurement is most commonly used for complex, or fast track projects, where risks tend to be high. Some design responsibility may be included in the arrangement. Thus, here we see a partial flow of control from the client and architect to the constructor.

Under the 'design and build' option a client will offer the basic concept, or a brief, to construction companies who will undertake (with their own design team) to deliver the completed building largely to performance based requirements. This system sees the contractor responsible for designing all aspects of the project to meet the performance requirements of the client, within the agreed budget. Under this option the client and architect will have 'surrendered' most of the control over the type of fire protection chosen and over the applicators that are selected for its installation.

Lastly, we have PPPs and the PFI. Recent governments have been committed to partnerships with the private sector to deliver modern and effective public services. The PFI has been the main vehicle for delivering successful PPPs. PFI projects can only go ahead where they demonstrate clear value for money against a 'traditional' procurement. This involves a comparison between the PFI proposal and a Public Sector Comparator, which estimates the costs of a 'traditional' procurement in which separate arrangements will exist for the construction, maintenance and operation of a service. Within the concept of the PFI, government departments and local authorities seek companies who will provide a building at their own expense. The cost will be met by the main contractor drawing funds from either the users, or the authority, for the use of the facility over an agreed period of time. In this way it is intended that the original design will meet the

d up thinking for fire nment is asking for it!

requirements of the client in functional terms, but will also have to be capable of being maintained over a long period within projected income limits, if the main contractor is to meet his cost and profit objectives from the construction and use of the facility over the agreed period. Again, here the client and architect will have 'surrendered' most of the control over the type of fire protection chosen and over the applicators that are selected for its installation.

So what are the ramifications for the quality of the fire protection systems that are installed under these various construction methods?

In an ideal world all of these construction techniques would lead to the most appropriate systems being correctly installed and maintained. We don't, however, live in an ideal world! We live in one where the onus for evaluating the fire risk lies with the Responsible Person for the building and in the first instance, this is likely to be an employee of the client that takes control of the building. Of course, if the building is a speculative development then the Responsible Person will not be known at the time of construction.

For the traditional designer led construction process the responsibility for the fire protection systems lay with the client and their architect and given this 'ownership' the onus, in the opinion of the ASFP, is more likely to lay at the quality end of the spectrum with regard to the choice of products and their installation contractors.

The management contracting construction process sees the client and their architect 'loosen' their control over the design and the construction of the building and under the design and build process, this 'loosening' can be further extended. In the experience of the ASFP, this can lead to the appointed constructor putting pressure on the fire protection sub-contractor to 'cheapen' up their bid by using lower grade products and/or by using lower cost (equates to less experienced!) labour.

This possible downgrading of the quality of the installed fire protection can be avoided. The client for the building should insist that the products to be installed be listed in a document that is referenced as a source of information in Approved Document B, that the installers are third party certified and members of a trade association with an enforceable code of practice.

With regard to PPP/PFI, the same recommendation in the above paragraph stands, but here we expect the Government to follow its own advice as well as members from the DTI, ODPM (now the Communities and Local Government Department) and the OGC are members of the Strategic Forum for Construction (SFC). In the SFC report 'Accelerating Change' which followed on from the earlier report 'Rethinking Construction' from the Construction Task Force, the SFC sets out its vision 'for the UK construction industry to realise maximum value for all clients, end-users and stakeholders and exceed their expectations through the consistent delivery of world-class products and services'.

The Strategic Forum set two targets. The first being that, by the end of 2004, 20% of construction projects by value should have been undertaken by integrated teams and supply chains and 20% of client activity by value should embrace the principles of the Clients' Charter. The Confederation of Construction Clients in response to 'Rethinking Construction' established the latter. The charter is designed to meet the minimum standards that they expect in construction procurement today, their aspirations for the future and it includes a programme of increasingly demanding targets to drive up standards. By the end of 2007 both SFC targets should rise to 50%.

In its sector, the ASFP sees little or no evidence that these targets have been taken seriously. Given that 60-70% of commercial construction has Government money involved, shouldn't the Government be leading the way when it come to best practice in the construction of buildings? Shouldn't it take the advice of the guys from the DTI, DCLG and the OGC?

The latest version of Approved Document B, which came into force on 6 April 2007, moves towards joined up thinking with the advent of the new Regulation (16B), which has been introduced to ensure that sufficient information is recorded to assist the eventual owner/occupier/employer to meet their statutory duties under the Regulatory Reform (Fire Safety) Order 2005.

Now that Government is showing some interest in joined up thinking, the ASFP looks forward to hearing from other bodies wishing to participate constructively in a 'Structural Fire Protection Forum.' IFP

Effective fire system warning devices

All emergency alarm systems contain audible and visual signals to alert people of danger once a hazard has been detected. Until the development of the folded horn sounder, the fire alarm bell was the only audible warning device available; although it generates a familiar and unambiguous noise, it was originally a current hungry device, unsuitable for use in today's systems.

By Malcolm Burrows

Cranford Controls

Recent technology advances in the design of fire alarm bells have reduced current consumption significantly; they now require only a few milliamps for operation, making them compatible with electronic sounders. Bells are still extremely popular, particularly in smaller and less sophisticated installations. Obviously, they only generate a single tone, unlike electronic sounders where today's devices typically generate 30 or 40 different tones. Part of the reason for the proliferation of different tones is that the various regulatory authorities often define specific tones, and, with multi-stage alerts increasingly common, several clearly distinguishable tones are obviously required to differentiate between the various stages.

The effectiveness of a sounder is highly dependent on the frequency of the tone being generated. The efficiency of the transducer is frequency dependent, as is the attenuation of the generated sound with distance. The convention, followed by most manufacturers, is to state a dB(A) output level at 1 metre, but specifiers should carefully read the small print in the specification, because in a multi-tone sounder, the dB levels of the various user-selectable tones of different frequency can vary drastically. In general, for lower frequency tones of less than 1000Hz, the lower the dB output level, and for higher frequency ones, greater than 1000Hz, the higher the dB level. Given that sound is a pressure wave, it is not difficult to see that to convert electrical energy into sound is less

efficient at lower frequencies because the transducer has to move larger volumes of air to achieve the same sound pressure level. The attenuation factor with distance is also frequency dependent, with the attenuation slope steeper at higher frequencies: in everyday life, this is why one only hears the bass notes from a loud source of music some distance away. The other consideration to be taken into account is the tolerance specified for the output level: 3dB makes quite a difference.

The majority of manufacturers produce different families of devices offering various output levels and physical configurations, both to ensure that the output of the device is suitable for the application and to give low cost installation. Typically, sounders are either stand-alone wall or ceiling mounted devices; alternatively for many commercial applications the sounders are designed to be mounted under smoke detectors to reduce installation costs and to give a single integrate unit.

In the UK, BS5839 Part 1, the Code of Practice for the installation of fire alarm systems, states that the output from a sounder must be between 65 and 120dB(A) and that the overall output from the sounders must be at least 5dB above the known ambient background noise level. The sound level reduces by 6dB every time the distance from the source doubles, so, for example, in an environment with an ambient noise level of 65dB(A), the effective distance of a 100dB(A)@1 metre sounder is 32m, the distance at which the sounder output level reduces to 70dB(A). Compare the effective distance, 32m, of a 100dB(A) sounder with that of an 88dB(A) unit, which drops to 70dB at 8m, giving an area coverage 16 times greater with a 12dB difference in output level. This reduction in the effective distance emphasises the importance of checking the output level against frequency. However, high output sounders should not be used in low ambient noise areas or as a means of "drenching" the area in sound. Alarm systems that are too loud may be dangerous, cause panic, discomfort, and make communication very difficult, impeding evacuation procedures. The overall alarm level throughout the area should be a maximum of 10 to 15dB above the ambient background noise. Combined voice and tone alarms give an unambiguous message if used correctly, but the voice component is more likely to be more directional and will usually be at least 6 dB(A) less than the tone; this must be allowed for when designing the system as the tone element will be audible at least twice as far away as the verbal messages.

In the open, sound will spread in all directions, but in an enclosed space, some will be reflected, giving an increased sound level. The closer a wall-mounted sounder is positioned to the ceiling, the more sound will be reflected; for a ceiling mounted unit, the reverse is equally true. A sounder mounted on a wall is more effective than when mounted on a pillar. Sounders should be sited so as to avoid immediate obstacles and at an ideal height of 2 to 2.5 metres. Synchronised sounders give a more effective overall effect because the sound pressure waves tend to reinforce each other rather than cancelling themselves out.

Combined voice and tone alarms give an unambiguous message if used correctly, but the voice component is more likely to be more directional and will usually be at least 6 dB(A) less than the tone.

Visual warning devices

Increasingly, fire legislation around the world is requiring that audible warnings are supported by a visual indicator to ensure that the deaf are made aware of an emergency. A further increasingly common requirement is that beacons should be synchronised to reduce the risk of triggering epileptic seizures in susceptible people. A visual indicator should only be used as reinforcement to an audible signal, not as the primary hazard signal. The visibility of a beacon is dependent on the brightness of the light source and the lens colour: as a rule of thumb, the intensity of a beacon is reduced by 25% as the viewing distance doubles.

Beacons should be positioned to be in direct line of sight with the maximum light output emitted over the desired area of coverage. The effective area of a beacon is a function of the typically horseshoe shaped Xenon tube and the mounting angle of the lens. Operating at very high voltage generated by an inverter circuit, the Xenon gas in the tube breaks down, creating an instantaneous

	Lens colour					
Light Source	Clear	Yellow	Amber	Red	Blue	Green
Xenon	100%	93%	70%	23%	24%	25%
Filament	100%	95%	70%	17%	17%	12%

brilliant flash of light, normally enhanced by using a 'Fresnel' lens. The light energy of the flash is a function of the Xenon tube size, the voltage across it and the capacity of the capacitor discharging into it. The Xenon strobe beacon has the best light output to power input ratio and is the most widely used and versatile technology currently available. Tube life is critical: it may be as little as 1 million flashes in cheaper devices but specifiers should typically expect 5 to 8 million flashes from higher quality units. All round light dispersion should be the first consideration when installing a beacon; ensuring free air movement to prevent the build up of excessive heat, is also important. Xenon beacon manufacturers specify performance in a number of ways: probably the most common measure is the incident energy applied to the beacon tube, expressed in Joules or the incident energy of the device measured in Watts. More meaningful are the peak and average output light emissions expressed in candela. "Brightness", often presented as a polar plot, is often used for more accurate calculations and coverage predictions. The perceived brightness of a beacon is dependent on the brightness of the light source, the lens colour of the unit and the ambient light level.

The effect of lens colour on the perceived intensity of the light source within an industrial environment is quite significant.

Beacons employ either Xenon tube technology, where the Xenon gas in the tube breaks down under power, creating an instantaneous brilliant flash of light, normally enhanced by using a 'Fresnel' lens. The light energy of the flash is a function of the Xenon tube size, the voltage across it and the capacity of the capacitor discharging into it. The Xenon beacon has the best light output to power input ratio and is the most widely used technology currently available. Recently, LED technology has rapidly developed, and the

The visibility of a beacon is dependent on the brightness of the light source and the lens colour: as a rule of thumb, the intensity of a beacon is reduced by 25% as the viewing distance doubles.

emergence of ultra bright LEDs means the LED beacon has become a viable and effective low maintenance alternative to the Xenon strobe. The use of multi-LED arrays enables different flash rates, rotating modes and steady state illumination to be easily achieved, extending the capabilities and versatility of the units.

Conclusions

Sounders are the primary mechanism for alerting people in the event of an emergency. Voice alarms and strobes also have their benefits; the main job of the system designer is to ensure that the audible and visual output levels are adequate throughout the protected area. With so many different sizes and styles of sounder and beacon, offering different output levels and degrees of control available, it is essential that the system designer and manufacturer work closely together to ensure that the optimum devices are specified for each type and size of protected area. The implications of choosing between explosion proof and intrinsically safe units for hazardous area use and the levels of environmental sealing required for devices installed in dusty or dirty areas are further complications; again, the manufacturer is in the best position to assist the system designer achieve an effective solution at realistic cost. IFP

Advances in fire detect performance and reduc

False alarms are a major concern of both the automatic detection industry itself and the Fire and Rescue Services: in 2004, the last full year for which statistics are currently available, out of a total of 448,000 false alarms, more than 280,000 were attributed to automatic fire systems.

By Stuart Ball

System Sensor Europe

The percentage of false alarms attributable to automatic systems has risen steadily: in 1994, the figure was 123,000; ten years on it has increased by 230% to 286,000, with an estimated cost of more than £1 billion. The problem is being addressed by control panel and detector manufacturers, who have invested heavily in hardware and software developments to reduce the incidence of unwanted alarms, and by the Fire Services, who have started to implement alarm management procedures in sites where there is an established track record of persistent false alarms.

In a rightly conservative industry such as life safety, new products tend to be evolutionary developments of existing, proven and accepted technology rather than revolutionary groundbreaking advances. Rigorous third party testing to international standards ensures that in such a critical industry, where the protection of people's lives and property is the objective, detectors perform in accordance with a comprehensive specification. Approved fire detectors, installed in accordance with well-understood principles, will offer rapid detection of incipient fires ranging from slow smouldering ones through to fast flaming alcohol or petrol-based ones.

All recent developments by the major smoke detector manufacturers seek to address one or more of four key technical objectives. The first two are fundamental to the device's operation; the third focuses on ease of installation, commissioning and use and the last driver addresses the need to extend the reach of the fire system into previously unprotectable areas. The four main criteria are:

- To improve detection efficiency
- To improve false alarm immunity
- To improve operational functionality
- To enhance system capability

or technology improve e false alarms

Obviously, it is intrinsically difficult to produce a single detector that can operate across such a wide input spectrum with equal effectiveness at all points. It is an accepted fact that the smoke detector offers the best combination of speed of response with immunity to false alarms for the majority of 'normal' applications; the ionisation smoke detector, originally developed in 1941, was the foundation stone for today's multi-billion pound global life safety industry. The ionisation technology is particularly effective in detecting the small particles of combustion produced by fast flaming fires; it is a less effective detector of the larger particles produced by smouldering ones. The optical detector is by far the most popular general purpose unit in use today; legislation and environmental considerations are heavily weighted in favour of optical technology. In most countries, it is becoming harder to obtain approval for an ionisation detector, and the regulations surrounding the transportation of radioactive materials are becoming more stringent and consequently more expensive. These two factors are rightly driven by environmental concerns and it is sensible that the use of products incorporating radioactive sources should be discouraged where a true alternative exists. End of life disposal costs of an ionisation detector are also significant.

Multi-sensor detectors

The most significant advance in detector technology has been the development of multi-sensor devices, primarily designed to overcome the relatively poor performance of the optical detector in responding to fast fires with low particulate generation but significant heat rise. Originally crude units, in which two independent sensors, an optical and a thermal detector, were mounted in a single housing, the increased availability of low cost embedded microprocessors has enabled true composite units to be developed. Signal processing in the detector head itself resulted in the panel being presented with a single composite result from the raw data generated by the two sensors, improving the effectiveness of the device across the fire spectrum.

The photo-thermal detector was developed to address the inevitable balancing act between increasing the sensitivity of a detector so that it responds more quickly to an incipient fire and the consequent increase in the false alarm rate.

The concept of the successful photo-thermal detector has now been extended. It is well known that every fire has a different profile during its development; however variable the fire, and however different are the characteristics of the inflammable material, all fires have three characteristics in common: they all produce carbon monoxide, heat, and particulate matter. The proportions change from one fire type to another, as does the time during which each element is produced, but in every case, to a greater or lesser extent, each of these three elements will be present, although in many phases the amount of each of the three elements may be very small. In cases where the fire is flaming, it will additionally produce a changing light signature as the result of the flame generation. Several manufacturers have introduced tri-sensor devices, in which the smoke and heat detectors are augmented by the addition of a carbon monoxide sensor. Again, embedded intelligence in the head manages the inputs from the three sensors. Extending this principle even further, the latest multi-sensor detector to be launched is a quad sensor device, which combines optical, thermal, carbon monoxide and infra-red detectors into a single device with six default alarm threshold settings.

Aspiration detectors

There have also been advances in other areas of fire detection technology. Until high sensitivity laser point detectors were introduced a few years ago, aspiration systems were the most effective way of providing very early warning protection for areas such as manufacturing clean rooms, telecoms facilities, high-tech diagnosis equipment in hospitals, data centres, computer suites, control rooms and other high value environments. Although they are significantly more sensitive to incipient fires or overheating equipment than LED optical smoke detectors, they do nevertheless have several significant disadvantages: they are a separate independent system, installed in parallel to the main fire protection system, consequentially incurring additional cost, and, unlike an addressable detection system, the location of an alarm condition can only be identified to a general area, not a specific detector position. Conversely, they have some significant advantages. They are an effective method of providing high sensitivity protection for "difficult" areas such as under-floor cable voids in computer rooms, where air velocities can be quite high as the false floor is typically used

to feed cooling air into the enclosures housing the equipment. They also have obvious applications for inaccessible and difficult to reach areas, and by incorporating suitable filters in the inlet pipes, dusty and dirty areas can also be effectively protected.

The latest hybrid aspiration system takes the best of both worlds, using the classical aspiration pipe network in conjunction with loop communications technology to integrate an aspiration capability into an addressable system. The high sensitivity laser detectors are addressed from the fire system loop as the detection engine for the aspiration system.

Radio communications

Communicating without the need of traditional wires has also become available. In some applications, for example historic or listed buildings, the building itself needs to be protected from the potential damage the installation of the detection system may cause, as well as the fire that is ultimately being detected. It has also been seen that in some cases there be an impasse between the strict rules about what can and cannot be done to a listed building and the Health and Safety/Fire Service requirements for the same building. So rather than hard wired connections, radio communications between the detectors, call points and panel provides greater flexibility in the design and implementation of the system. Installations where running cables into particular areas is difficult, if not impossible because of the construction methods and materials is another opportunity, as is the protection of temporary facilities erected for major sporting functions and the protection of workers during the construction phase of large developments.

Standards conformance

No reputable fire engineer would consider using unapproved smoke or heat detectors, but manual call points sometimes seem to be regarded as less important elements of the system. Several manufacturers or importers supply unapproved and untested call points, which are often promoted with meaningless statements such as "meets the requirements of", "designed in accordance with" or "conforms to" the relevant EN54 product standard, in this case EN54-11. While it is not mandatory, third party testing by a reputable test house does far more than simply confirm the physical construction and operation of the device. Extensive tests for environmental factors such as operation at elevated temperatures, corrosion tests, EMC tests and shock and vibration are carried out, so a third party test certificate gives the installer and user confidence that the call point conforms in all respects to the requisite standard. To use non-approved devices is a false economy, and all reputable suppliers will have submitted their products to specialist independent test houses such as BSI, LPCB or VdS.

No reputable fire engineer would consider using unapproved smoke or heat detectors, but manual call points sometimes seem to be regarded as less important elements of the system.

Conclusions

As an important part of the life safety industry, the world's leading fire detector manufacturers are constantly improving their products to increase the protection levels and false alarm immunity provided to the users of the buildings they protect. The provision of higher levels of performance than ever before is a trend that looks set to continue for the foreseeable future. IFP

CE marking Fire Ala

CE marking fire alarm control equipment to meet the requirements of the Construction Products Directive is not possible until the European standards applicable to the equipment become harmonised. Unlike most other components of fire alarm systems, the European standard for fire alarm control panels (EN54-2) is not yet harmonised. There is however one type of fire alarm control equipment that can be CE marked for the CPD, now.

By Robert Jefferys

Kentec Electronics Ltd

EN54-2 the European standard for Fire Alarm Control and Indicating Equipment (c.i.e), was many years in preparation and finally published in its first form along with EN54-4 a separate standard for Power Supply Equipment (p.s.e), in 1997.

Although difficult to interpret and understand, EN54-2 and EN54-4 were quickly adopted by most Fire Alarm Control panel manufacturers who were keen to ensure that their products were compliant to internationally recognised standards and would thus be acceptable to a wide market.

Since their publication, EN54-2 and EN54-4 have undergone several amendments and the latest amendment to the standard for power supply equipment (EN54-4:1997/A2:2006) was due for harmonisation on 1st June 2007 but has been further delayed.

EN54-2 is still undergoing revisions after which there will be still be a period before it is published and then becomes harmonised.

A harmonised standard for Fire Alarm Power Supply Equipment without harmonisation of the standard for the Control and Indicating Equipment itself means that at present, no Fire Alarm Control and Indicating Equipment can be CE marked in accordance with the Construction Products Directive.

Fire Alarm Control and indicating Equipment (c.i.e.) currently remains the only major part of fire detection and alarm systems for which a harmonised European standard does not exist. As can be seen from the table opposite, harmonised standards are in place for sounders, call points and most types of smoke, flame and heat detector .

There is however an exception to this.

Control Equipment for Fixed Firefighting systems (or extinguishing systems) can be CE marked in accordance with the Construction Products Directive.

The requirements and test methods for control equipment for extinguishing systems are covered by EN12094-1:2003 which became a harmonised standard on 1st February 2004 and replaced any conflicting national standards on 1st May 2005.

EN12094-1:2003 covers the requirements and test methods for electrical automatic control and delay devices (e.c.d) which may or may not be part of Control and Indicating Equipment.

Where an e.c.d is part of a c.i.e, EN12094-1 states that the c.i.e. part must comply with the requirements of EN54-2.

The power supply equipment (p.s.e) for and e.c.d. must comply with the requirements for EN54-4.

The Sigma XT Extinguishant Control Panel manufactured in the UK by Kentec Electronics Limited is one of the few extinguishant control panels that has been third party approved by a notified body to EN12094-1 and is CE marked in accordance with the Construction Products Directive.

Sigma XT panels also carry the BSI Kitemark logo which signifies that the type tested product is produced in a manufacturing environment subject to regular surveillance of Factory Production Control by the approving body (BSI).

Extinguishant control systems are widely used to protect valuable infrastructure or critical data and communications links and a certifiable standard for the control equipment protecting these vital facilities brings much needed peace of mind for end users, insurers and all concerned with the protection of these valuable assets.

Kentec Electronics Limited have specialised in the design and manufacture of standard and bespoke extinguishant control systems for many years and the publication and harmonisation of a standard for such systems along with the recently revised BS7273: Part 1: 2006 – (Code of Practice for the electrical actuation of gaseous total flooding extinguishing systems) which now references EN12094-1, allows the company to offer a complete range of fire alarm control panel products that are certified as compliant with European standards.

The Sigma XT extinguishant control panel consists of an EN54-2 compliant c.i.e with three conventional detection zones.

These may be configured to activate the e.c.d part in various logical combinations.

The e.c.d. section provides indications to show the status of the system and controls to change the mode of the system (from Automatic and manual to manual only) and to manually release the extinguishant.

The control panel also contains a generous, EN54-4 compliant power supply sufficient to

rm Control Panels

provide power for the control equipment, activate release solenoids, operate first and second stage sounders, charge the batteries and supply power to a range of status indicator units and ancillary relay boards.

One of the major beneficial features of the Sigma XT extinguishant control panel is the use of a two wire serial data bus for connection of system status units and ancillary relay boards for interfacing to other systems. This saves a considerable amount of installation wiring which saves time, increases reliability and reduces cost.

Contrary to the belief that standards stifle innovation and suppress development, the flexibility of the European fire panel standards and particularly the EN12094-1 standard allows the control equipment to be highly configurable.

As well as the EN12094-1 requirement to have prescribed and accurate extinguishant delay and duration settings, Sigma XT extinguishant control panels have many other configurable options which allow the control panel operation to be highly customised to suit individual applications.

Although not a requirement of the EN12094-1 standard, both the Sigma XT control panel and Sigma Si status units have a display, which after the system is activated and extinguishant release is imminent, shows the time remaining in seconds, until the extinguishant will be discharged. This unique aspect of the Sigma XT control panel is a significant safety feature as it allows personnel in a protected area to activate a Hold device if there is a potential danger to people still in the extinguishant area when a release is imminent.

Sigma XT extinguishant control panels are available in a wide range of language options and with customised logos if required making them suitable for use in most European states.

The reasons for the lack of a harmonised standard for what is probably the most critical component of a fire alarm system (the control panel) are not for discussion here but it will clearly be to the benefit of all when this is finally in place and can be policed.

Until then, EN12094-1 compliant control panels remain the only type of fire alarm control panels that can be CE marked in accordance with the CPD. IFP

HARMONISED STANDARDS AS PUBLISHED BY THE EUROPEAN COMMISSION	Date of applicability of the standard as a harmonised European standard	Date of the end of the co-existence period
EN 54-3:2001 Fire detection and fire alarm systems – Part 3: Fire alarm devices – Sounders EN 54-3:2001/A1:2002 EN 54-3:2001/A2:2006	– 01.04.2003 01.03.2007	– 30.06.2005 01.06.2009
EN 54-4:1997 Fire detection and fire alarm systems – Part 4: Power supply equipment EN 54-4:1997/A1:2002 EN 54-4:1997/A2:2006 EN 54-4:1997/AC:1999	– 01.10.2003 01.06.2007 01.06.2005	– 31.12.2007 01.06.2008 01.06.2005
EN 54-5:2000 Fire detection and fire alarm systems – Part 5: Heat detectors – Point detectors EN 54-5:2000/A1:2002	– 01.04.2003	– 30.06.2005
EN 54-7:2000 Fire detection and fire alarm systems – Part 7: Smoke detectors – Point detectors using scattered light, transmitted light or ionization EN 54-7:2000/A1:2002 EN 54-7:2000/A2:2006	– 01.04.2003 01.05.2007	– 30.06.2005 01.08.2009
EN 54-10:2002 Fire detection and fire alarm systems – Part 10: Flame detectors – Point detectors EN 54-10:2002/A1:2005	01.09.2006 01.09.2006	01.09.2008 01.09.2008
EN 54-11:2001 Fire detection and fire alarm systems – Part 11: Manual call points EN 54-11:2001/A1:2005	01.09.2006 01.09.2006	01.09.2008 01.09.2008
EN 54-12:2002 Fire detection and fire alarm systems – Part 12: Smoke detectors – Line detectors using an optical light beam	01.10.2003	31.12.2005
EN 54-17:2005 Fire detection and fire alarm systems – Part 17: Short-circuit isolators	01.10.2006	01.12.2008
EN 54-18:2005 Fire detection and fire alarm systems – Part 18: Input/output devices	01.10.2006	01.12.2008
EN 54-20:2006 Fire detection and fire alarm systems – Part 20: Aspirating smoke detectors	01.04.2007	01.07.2009
EN 12094-1:2003 Fixed firefighting systems – Components for gas extinguishing systems – Part 1: Requirements and test methods for electrical automatic control and delay devices	01.02.2004	01.05.2006

Current list of harmonised fire alarm component standards (source, Europa.eu)

Halon destruction – the environmental myth

In 1989, the production of Halon was banned under the terms of the widely adopted Montreal Protocol. Since that time, it has been corporations and governments across the globe have been struggling to come up with a strategy that deals with halon already in existence.

By Don Connor

Halon Banking Systems (Canada)

Of course, many companies have opted to immediately remove existing halon from their facilities which in-turn has created a strong recycling market. However, there has always been a movement in the fire protection and environmental communities that supports the destruction of Halon as the preferred strategy to meet with the requirements of the Montreal Protocol.

The Halon Technical Options Committee has stated that the existing supply of Halon 1301 is balanced with the demands of critical end-users. In the next five years, the consumption of Halon 1301 is expected to remain steady as halon alternatives are tested in applications such oil and gas production and the manufacturing of aircraft. In light of this balance, it is critical that those who seek to destroy their halon, understand the effects that this will have on the open market.

As one of the early signatories to the Montreal Protocol, Environment Canada has clearly stated that they are in favour of halon destruction. Jean Carbonneau of the Canadian Government's *Ozone Layer Protection Program* has stated, "Environment Canada favours the destruction of halons because essentially every kilogram of halon destroyed is not released to the atmosphere. Since halons are synthetic chemicals, the destruction of halon ensures that on harm is done to the natural environment." Clearly, it makes sense that by destroying existing halon, we guarantee a reduction in world halon inventory, until we eventually reduce the planet's annual halon emissions to zero. But many that agree with this fact warn of a potentially surprising flipside.

The Halon Technical Options Committee has stated that the existing supply of Halon 1301 is balanced with the demands of critical end-users.

As we already know, the 2007 world supply of halon is adequate in meeting with the demands of halon consumers. Quite simply, any destruction of halon will very likely imbalance supply and demand. It is foreseeable that essential end-users, faced with decreasing worldwide halon inventories, will have no other alternative but to revive their production of new halon 1301.

The best strategy is to ensure that the halon is reclaimed in line with best industry standards and is made available to critical end-users. It is essential that the halon end up with essential end users so that we can be sure that the halon when no longer needed will be destroyed.

It is important that we look at the entire process of how the halon is recovered, redeployed and eventually destroyed when there are no longer critical applications.

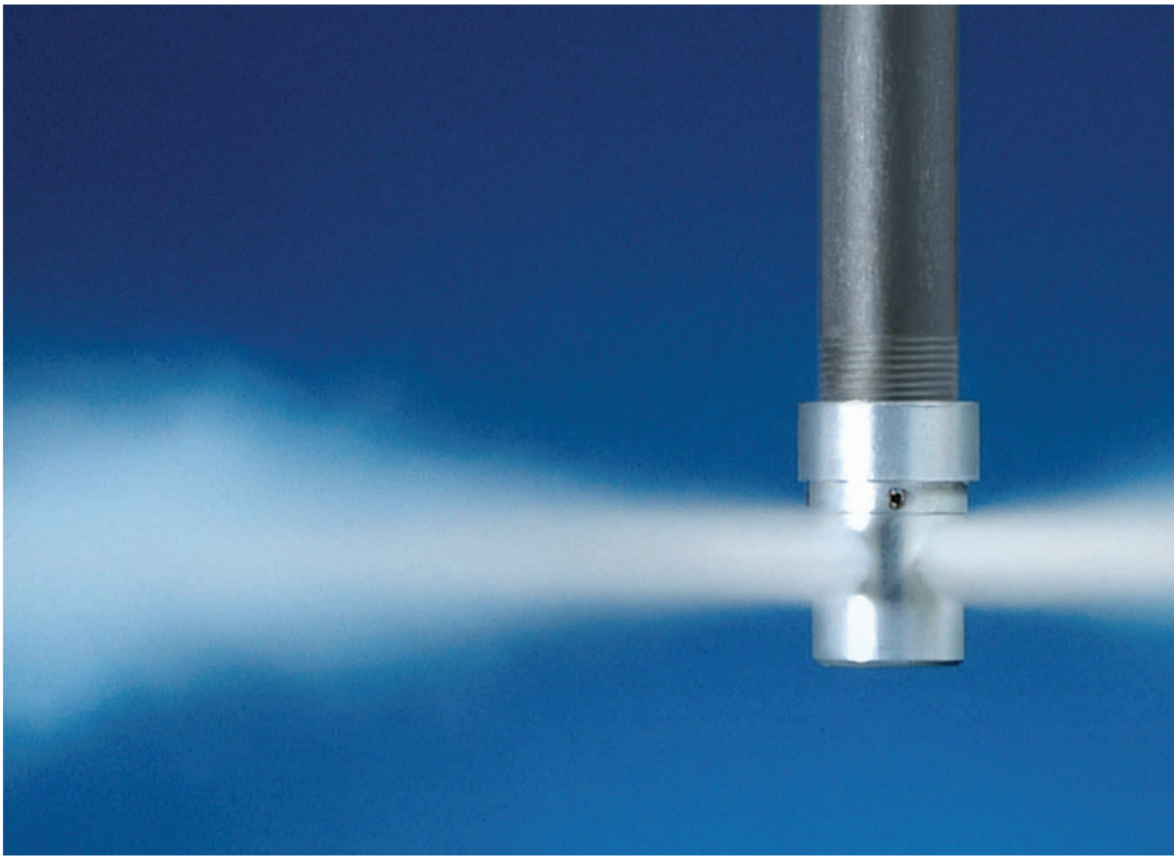
It has been argued that there are no critical applications for halon, however the aviation industry, among others, have not produced a suitable halon replacement. While alternatives are reviewed and tested, nothing in the short term can be looked upon as a suitable replacement for new systems, let alone the requirements of the existing systems that need to be maintained in order to meet airworthiness safety standards.

The process of reclamation starts with having the halon removed by a qualified fire protection company. It is imperative that the company having the halon removed makes sure that the company they are using will process the halon in an environmentally efficient way. The company removing the halon should be sure at the time they remove the halon they have the necessary information to safely disconnect the halon cylinders. Since all halon systems will be more than 15 years old it is sometimes difficult to find information on these systems, but it is the imperative to make sure the system is handled correctly. At this point there is a large concern for safety in addition to the inherent environmental concerns. Halon systems are designed to fully discharge in 10 seconds or less, so if they are disconnected improperly they can result in injury or death. All fire suppression systems must be handled by qualified individuals.

It is important that we look at the entire process of how the halon is recovered, redeployed and eventually destroyed when there are no longer critical applications. IFP

HFCs as Fire Ex Clarification of

Fike Nozzle



A number of voluntary and regulatory initiatives exist today that are designed to protect the environment from ozone depletion and climate change; however, confusion related to these initiatives can often lead to misinterpretations, misunderstandings, and unfounded and exaggerated concerns in a number of areas. These misrepresentations are evident in the use of hydrofluorocarbons (HFCs) as clean agent fire suppression materials. This article describes in greater detail some aspects of these various environmental initiatives in order to provide a clearer picture of how they apply to and affect the fire protection industry.

By Ken Blanchard

Global Segment Manager, DuPont Fire Extinguishants

The Regulatory Initiatives

The key regulatory initiatives discussed below are the Montreal Protocol, the Kyoto Protocol, the European Union (EU) F-Gas Regulation, which is part of a group of regulations aimed at meeting the EU commitment under the Kyoto Protocol, and recent actions by the California Air Resources Board (CARB). Although the U.S. has not ratified the Kyoto Protocol, some states including California, have passed climate change legislation. This article will touch on voluntary initiatives within the fire protection industry that have significantly limited HFC emissions. As a result, the total amount of HFC emissions attributed to the fire protection sector is below 2.5 per cent of total HFC emissions. This represents less than 2 per cent of global greenhouse gas (GHG) emissions, according to industry estimates.

Two of the most prominent regulations are the Montreal Protocol and the Kyoto Protocol. The Montreal Protocol, enacted 20 years ago, is an agreement targeting substances that deplete the ozone layer. Specifically, it focuses on reducing, and ultimately eliminating, global production, consumption and emissions of ozone-depleting substances (ODS), such as halons. The Montreal Protocol has been very effective in significantly reducing the risk of ozone depletion and, therefore, reducing

tinguishants: Regulation

contributions to global climate change. Conversely, the Kyoto Protocol is a global treaty designed to reduce the emissions of carbon dioxide and five other GHGs; however none of the GHGs grouped in the Kyoto Protocol are ODS. Actions to directly address global climate change under the United Nations Framework Convention on Climate Change and its Kyoto Protocol have only just begun.

The Montreal Protocol on Substances that Deplete the Ozone Layer

In 1974, scientists first published a hypothesis on chlorofluorocarbons (CFCs) and ozone depletion. After more than a decade of scientific research into the potential impact of CFCs and other compounds, such as halons, on the ozone layer, this scientific consensus served as a basis for an unprecedented international agreement called the Montreal Protocol. The Montreal Protocol was signed in 1987 by 27 nations. Today, more than 190 countries have agreed to phase out ozone-depleting substances as part of this treaty. During the first few years of the Montreal Protocol, the focus was on phasing out CFCs in developed countries ahead of the 1996 deadline. They were subsequently replaced by hydrochlorofluorocarbons (HCFCs), which have lower ozone-depletion potential (ODP), and HFCs, which have zero ODP. The second phase of the Montreal Protocol, currently underway, is directed at phasing out HCFCs by 2030 in developed countries and by 2040 in developing countries. Recent proposals by countries party to the Montreal Protocol suggest that this phase-out schedule may be accelerated further.

The terms of the Montreal Protocol have resulted in an additional environmental benefit that is often overlooked: the reduction of emissions linked to climate change. ODS, such as halons, are also greenhouse gases, which are largely responsible for global warming. As a result of the implementation of the Montreal Protocol, the reduced greenhouse gas impact from the elimination of CFCs and halons is far greater than the reduction target of the first commitment period of the Kyoto Protocol.

Although the Montreal Protocol has been a significant driver in the conversion away from halon extinguishants in the fire protection industry, it does not control the use of HFC fire extinguishants. Halons have extremely high ODP – three to ten times higher than any other agent. By contrast, HFCs used as clean agent fire extinguishants in both total flooding systems and portable extinguishers have zero ODP. Most HFC clean agent fire extinguishants also have global warming potentials (GWP) that are less than half the direct GWP of Halon 1301. These factors are increasing the popularly of HFCs, which are becoming the preferred fire suppression alternative to halons in many industries.

The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol

The UNFCCC was agreed upon in 1992 and has now been ratified by 189 countries, including the U.S. The main objective of the Convention is to "achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."[1] Provisions of the Convention state that the level must be achieved within a time frame that is sufficient for ecosystems to adapt naturally to climate change, to ensure that food production is not jeopardized, and to enable continued economic development.

The 1997 Kyoto Protocol, which was ratified in February 2005, is an agreement under the UNFCCC that requires developed countries to meet target net emission of a "basket" of GHGs over the period 2008-2012. That "basket" of GHGs includes carbon dioxide, methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride.

A key differentiator between the Montreal Protocol and the Kyoto Protocol is that HFCs are

not controlled by the Montreal Protocol because they do not deplete the ozone layer; however, they are included in the Kyoto Protocol, due to their GWP. Another significant difference between the Montreal Protocol and the Kyoto Protocol is the fact that the Montreal Protocol requires the phase-out of ODS, while the Kyoto Protocol focuses on GHG emissions reductions. Countries committed to meeting the targets set in the Kyoto Protocol must develop specific programs to reach emissions reduction objectives. Unlike the Montreal Protocol, which prescribes a specific process for phasing out ODS, the Kyoto Protocol does not detail how countries should meet the targets. Instead, the Kyoto Protocol sets the goal and leaves the means of achieving those goals to individual countries and the industries committed to the terms of the treaty.

F-Gas Regulation in the European Union

In anticipation of the Kyoto Protocol, the EU, in August 2003, proposed the F-Gas Regulation. The F-Gas Regulation is one of the tactical programs that the EU views as part of its efforts to meet the goals detailed in the Kyoto Protocol.

The objective of the F-Gas Regulation is to prevent and reduce emissions of fluorinated gases (HFCs, PFCs and sulfur hexafluoride) covered by the Kyoto Protocol. Within the fire suppression industry, HFC emissions are currently at such low levels due to voluntary actions taken by industry that fire suppression is considered a non-emissive source. As a result, no restrictions are imposed for HFCs in fire suppression as part of the F-Gas Regulation.

In a recent summary of the F-Gas Regulation for the fire protection industry, the British Fire Protection Systems Association (BFPSA) announced no restrictions on the production, sale, or use of hydrofluorocarbons (HFCs).[2]

California Air Resources Board

In the United Sates, the California legislature has begun drafting a policy directing the California

Environmental Protection Agency (EPA) to achieve maximum GHG emissions reductions.[3] CARB has assumed responsibility for identifying opportunities to reduce F-Gas emissions.

Similar to the EU F-Gas Regulation, CARB has not included HFCs used in fire suppression applications on its early action items list. Even during a recent CARB international symposium to discuss possible early action measures, there was no public discussion on whether to include HFCs in fire protection on the early action list. Again, this is likely due to the effective actions taken by industry to minimize emissions of HFCs in fire suppression applications to date.

Voluntary Codes of Practice to Reduce HFC Emissions

Voluntary codes of practice within the industry, supported by organizations such as the National Fire Protection Association (NFPA) and the International Organization for Standardization (ISO), clearly outline environmentally responsible methods for installing, maintaining and servicing fire suppression systems. These measures have proven highly effective in reducing emissions in fire suppression applications. The industry has also worked closely with the U.S. Environmental Protection Agency (EPA) to develop a reporting program aimed at tracking emissions. As a result of these voluntary and stringent maintenance and inspections programs, emission rates for HFCs in fire protection are extremely low – 2.5 per cent for total flooding systems and 3.5 per cent for portable extinguishers. As detection technology and fire protection hardware continues to improve and with the ongoing support of the fire protection industry, it is anticipated that emissions from this sector will continue to decline.

Conclusion

HFCs are well established as reliable and highly effective clean agent fire extinguishants that are essential to ensuring life safety and protecting high value property in the event of a fire. They have zero ODP, which makes them an alternative option to halons and facilitate their phase out two years before the other ozone-depleting substances defined in the Montreal Protocol. This helps to reduce climate change caused by the high GWP that is characteristic of halons.

Some alternative clean agents with zero ODP and lower GWP have been marketed for total flooding applications; however, higher costs and/or technical issues, such as longer discharge times and greater engineering requirements, have proven to be significant disadvantages *versus* HFC fire suppression technologies. Portable clean agent fire extinguishants with zero ODP and low GWP have yet to be developed.

Despite the consistently effective performance and zero ODP benefits of HFC clean agent fire extinguishant technologies, questions still exist regarding the environmental regulations that address HFC emissions. The Kyoto Protocol, F-Gas Regulation and the actions that have been identified by CARB do not impose limits on the use of HFCs in fire suppression, as those efforts are focused in areas where emissions are more prevalent and significant than in fire suppression applications. Voluntary codes of practice within the industry have already significantly minimized emissions, and it is expected that remaining emissions will decrease further with continued improvements in process technologies and equipment, making HFC clean agent fire extinguishants a sustainable technology well into the future. IFP

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Ken Blanchard is the global segment manager for DuPont Fire Extinguishants. He has has been with DuPont for more than four years, and has more than 14 years of experience in the fire protection industry. Ken is active with Halon Alternatives Research Corporation (HARC), National Fire Protection Agency (NFPA), and other associations, and is based in Wilmington, Delaware. He may be contacted at Kenneth.V.Blanchard@usa.dupont.com

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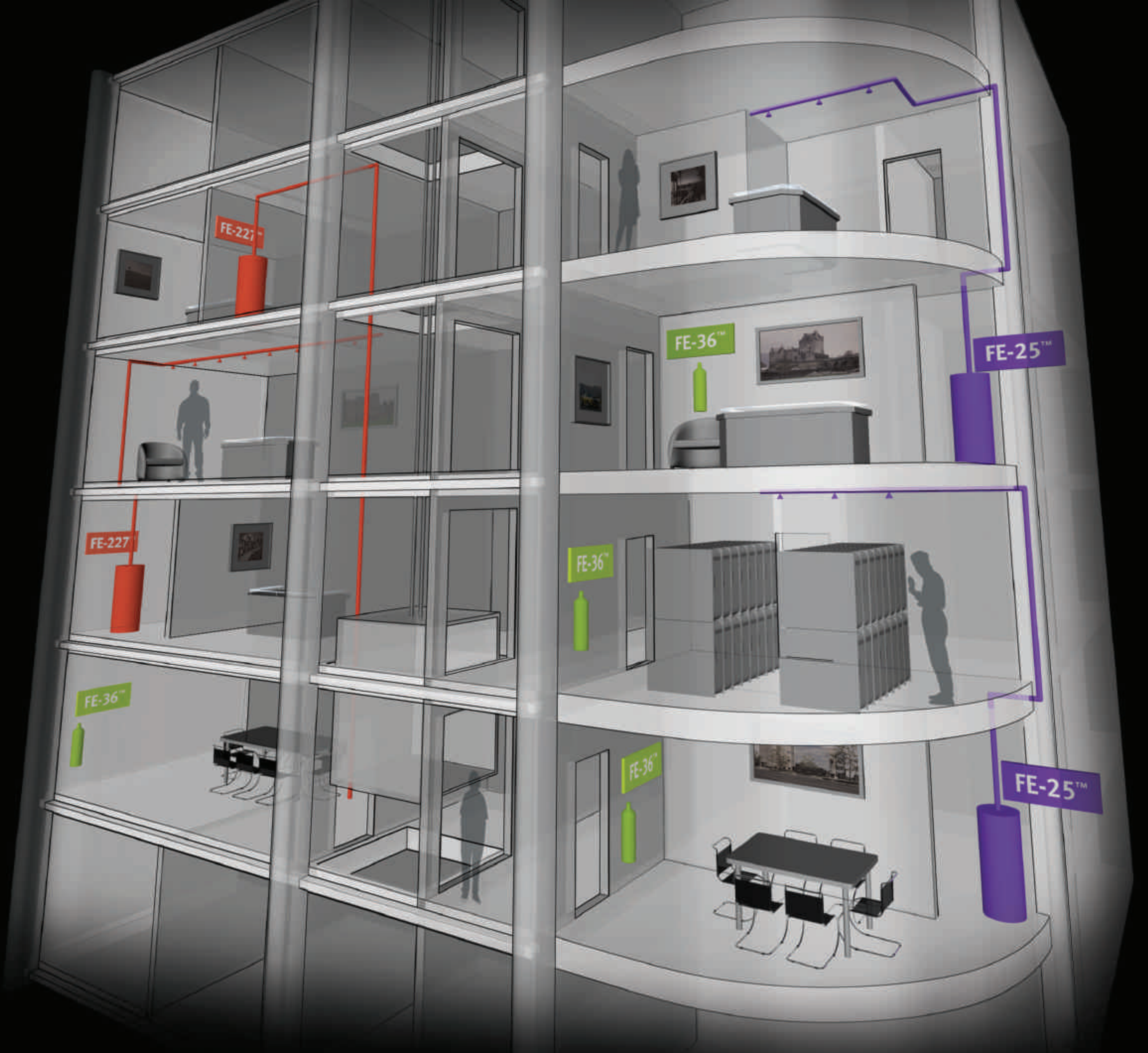
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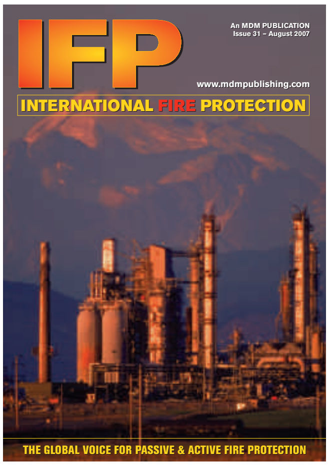

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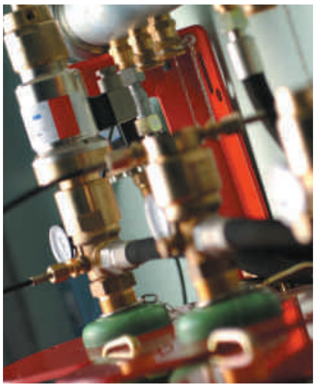
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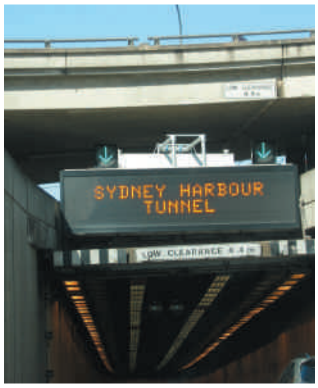

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Firewall – the Easy Solution For Improved Fire Safety

Internal wall specialist, PERFORMANCE PANEL SOLUTIONS, has launched the FireWall panel system. The pre-finished panels are ideal for non-loadbearing internal partition walls, where tested fire resistance is required.

The Regulatory Reform [Fire Safety] Order that came into effect last October has had wide-ranging consequences across all industry and the new requirement for fire risk assessments is highlighting the need for improved passive fire safety. The FireWall system is ideal for dividing large volumes into compartments and protecting escape routes both in new build and refurbishment. FireWall will meet all the requirements for compartmentation and protected zones in Building Regulations Approved Document B.

Many insurers are already insisting on improved passive safety such as fire rated compartment walls. The Association of British Insurers [ABI] in their design guidance actually states, 'Increased use of compartmentation should be considered for new and existing premises to limit spread of fire.'

FireWall panels have been tested to BS476 Part 22, for fire resistance and assessed to LPS1208 to satisfy the fire resistance requirements for compartmenation in the LPC 'Red Book' Design Guide

The panels are manufactured from two galvanized polyester-coated steel sheets bonded to a mineral wool insulation core. Mineral wool offers superior fire performance, as it is a non-combustible material, rated Euroclass A1 – the highest European classification available.

The FireWall panel system is remarkably easy to install, with no specialist skills required. An interlocking joint detail on each panel means there is no need to seal any joints, so no wet trades are required on site. Openings for doors or internal windows can be easily cut out and fixtures slotted into place.

As the panels are pre-finished follow-on trades can start as soon as the walls are erected and, in terms of maintenance, they can just be washed down.

Mike McColl, managing director of Performance Panel Solutions, said: 'The FireWall panel system has been developed with durability, structural and fire performance in mind. The system provides an easy to install solution that will meet all the requirements for compartmentation and protected zones in Building Regulations Approved Document Part B.'

Contact details:
Tel: 0191 280 0130
Website: www.performancepanel.co.uk

New R&D Manager Set To Protect The World Against Fire!

LEIGHS PAINTS (the market leader of Fire Protection coatings) has appointed Simon Hallam as Fire and Insulation Laboratory Manager, with the responsibility of developing innovative fire products for the civil construction and offshore oil markets.

Simon has 10 years of research and development experience in the high performance coatings industry and throughout his career at Leighs has worked on a number of development projects. These have included both solvent and water based materials that have been successfully launched into the market place.

Gordon Bell, Technical Director for Leighs Paints, comments:

'Our vision for this part of the business is "To Be World Class in R&D". Simon's drive and commitment will play a vital role in helping Leighs to achieve this.'

Along with a strong team, Simon is one of the key forces behind Leighs Paints maintaining its position as a World class leader in fire protection.

For further information please contact:
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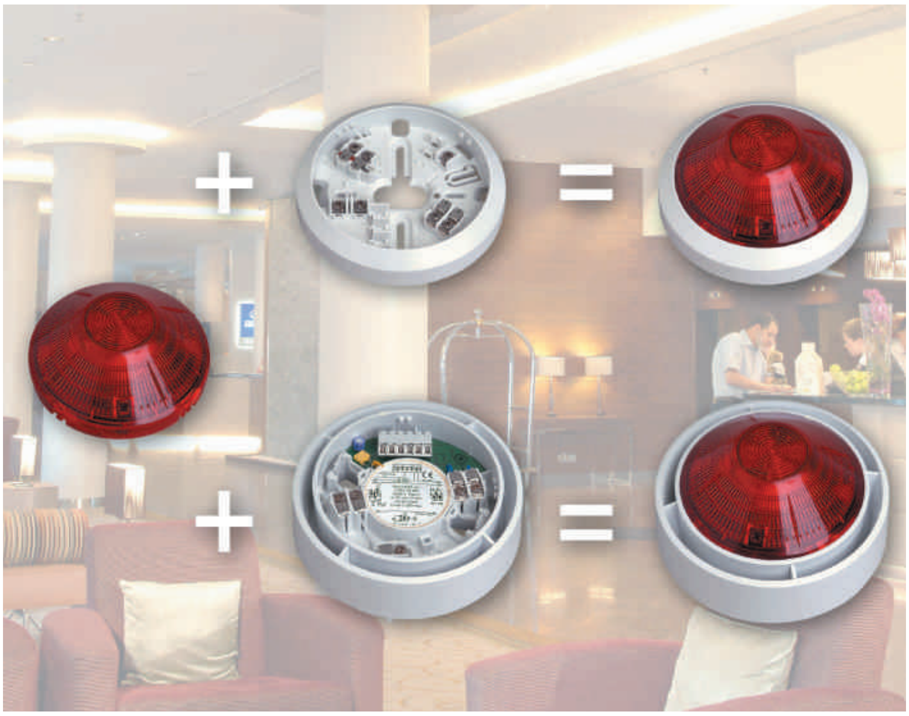
New fire alarm visual notification appliance from Bosch

Easy integration into existing and new LSN solutions



- Maximum light intensity at 1 Hz frequency for high level of visibility
- Low current consumption allows connection of a large number of peripheral elements
- Compatible with EN 54-23

BOSCH SECURITY SYSTEMS has added a visual notification appliance to its range of 420 Series fire-detector accessories. The Strobe 420 Series is compatible with Bosch's base sounder to provide optimal visible and audible fire alarm warning in a wide range of applications. The strobe has a new LED design that produces synchronized, high-visibility flashes at 1 Hz. Light flashing in the 1 to 3 Hz frequency range avoids possible blinding effects or disturbance to persons with photosensitivity. The 420 series strobe is an addressable device with the advantage that it is loop powered, freely configurable and determining which strobe is switched on and in which event.

When used with a Bosch 420 Series detector base, the strobe can be used as a stand-alone device. In this case it is easily integrated into an existing or new Bosch Local SecurityNetwork (LSN) bus system. LSN is a freely configurable loop system that offers a wide choice of fire, intrusion and malfunction detectors, operator units and aiming devices from multiple manufacturers. It also allows automatic component identification, address assignment support and functional security in the event of cable interruption or short circuit.

The Strobe 420 Series is easily integrated into LSN systems by a straightforward power connection through the LSN loop. This, plus a low current consumption of 6 mA, facilitates planning of a new or existing fire alarm system and connection of a large number of devices to minimize installation effort. The unit has a tamper-proof housing that can only be removed by a technician.

The new strobe complies with the EN 54-23 standard – applicable in all European Union countries. Visual fire alarm devices are mandatory in most countries for facilities where people with partial or full hearing impairment are employed or are gathered.

See www.boschsecurity.com for further information.

C-TEC's Networkable Fire Panels get Carlisle 'x'cited

Four C-TEC XFP networkable analogue addressable fire panels are the new stars at Carlisle United Football Club.

The panels were installed after record floods in Cumbria devastated the grounds and resulted in the entire stadium being eight feet under water. With all electrical services including the fire alarm and voice alarm/public address system being damaged beyond repair, the race was on to get the life safety systems replaced cost-effectively and quickly.

With its competitive pricing and off-the-shelf availability, the XFP was the ideal choice. Says Graham Bell of Solid State, the company that carried out the installation: 'We needed a system which was easy-to-install, flexible and readily available and C-TEC'S XFP panels fitted the bill.'

The fire alarm system consists of four XFP 2-loop panels. One panel is housed in the CBS stand, two are housed in the West Stand and one is sited in the Match Day control room. Over three hundred XP95 devices ranging from Optical smoke detectors to input/output units controlling roller shutters are also connected to the networked system. A SigNET Integrity PA/VA system is also installed at the site.

For further information, please contact Alex Saint, Marketing Executive, on 01942 322744 or at alex.saint@c-tec.co.uk

Metacaulk® 1000 and Metacaulk® Wrap Strip from RectorSeal®

When it comes to servicing firestopped penetrations, it is commonly recognized that there is NO single product that can cover all applications. However, Metacaulk® 1000 and Metacaulk® Wrap Strip from RectorSeal® are two products recognized worldwide that can handle a vast majority of the most common site conditions encountered on your projects.

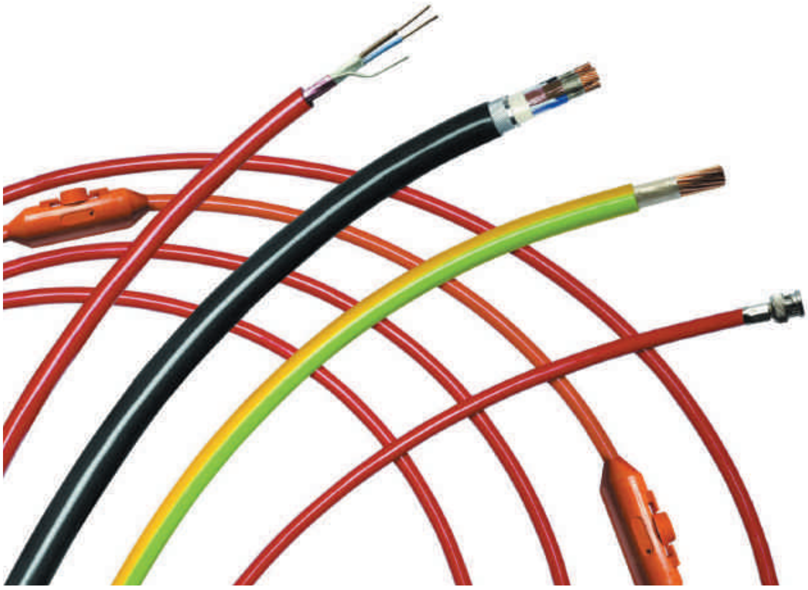
Metacaulk® 1000 is a highly intumescent, water-based, flexible sealant that provides an economical firestop solution for a wide variety of applications. It can be used with various metallic pipes, insulated pipes, plastic pipes, electrical and communication cables, busways, HVAC duct work as well as various construction joints. It has been tested in fire-rated assemblies of concrete slab, concrete and steel decking, pre-cast concrete planks and wood floor/ceiling assemblies, as well as gypsum wall board (plaster board). Metacaulk® 1000 has been tested in assemblies with up to a 4-hour Fire-Rating (integrity). Testing has been conducted under many standards including: BS 476, UL 1479, UL 2079 and ASTM E814. This product also has applications for both single and multiple penetrants within an opening.

The use of non-metallic piping has increased greatly in all types of construction. RectorSeal® has developed an easy-to-use, water-based, highly intumescent wrap strip material that is ideally suited for firestopping penetrations with plastic pipes. Metacaulk® Wrap Strip is available in 1 inch (25mm) and 2 inch (50mm) wide rolls. There are wrap strip firestop system designs for various plastic pipes up to 4 inches (100mm) in diameter. These pipes can be firestopped by simply wrapping Metacaulk® Wrap Strip around the pipe and positioning it within the opening. Larger plastic pipes of up to 14 inches (356mm) in diameter can be firestopped easily by using Metacaulk® Wrap Strip housed within a custom made Universal Collar strip. Additionally, Metacaulk® Wrap Strip has been designed for use with a variety of insulated metallic pipes and metallic HVAC ducts to provide firestopping through various fire-rated assemblies. RectorSeal's® Universal Collar is easy to use. It comes as a thin, die-cut, galvanized steel strip which is 50 feet (15.24 meters) long and it can be cut easily with tin snips to the length required. The Universal Collar will contain and direct the intumescing Wrap Strip material, allowing it to close off the penetration. This prevents the passage of fire through the assembly as the plastic pipe or the insulation is being consumed by a fire. For individual applications, using Wrap Strips and Universal Collars is far less expensive for the contractor than using specifically sized, pre-made collars. Universal Collars allow the contractor the flexibility of covering all sizes of plastic pipes (in millimeters or inches) without stocking specific pre-made units – taking the guess work out of ordering and reducing the total number of units stocked.

Metacaulk® 1000 and Metacaulk® Wrap Strip have been tested to meet or exceed the requirements of many codes and standards worldwide, such as those of the National Fire Protection Association (NFPA), Underwriters Laboratories (UL), British Standards (476), Singapore Approval, Taiwan Approval, and Factory Mutual (FM) to mention only a few. RectorSeal® firestop products have been and are currently used on many major building projects around the world.

RectorSeal® manufactures a complete line of Firestop products under the trade name, Metacaulk®. The product line includes sealants, putties, composite sheets, pillows, wrap strips, pipe collars and cast-in-place devices. For additional information, including Product Data Sheets, a volume calculation program and an excellent interactive Firestop System Selection Guide, visit RectorSeal's® website at www.metacaulk.com. Information on all of the quality products manufactured by RectorSeal® for the professional contractor is also available on the website, www.rectorseal.com, or by calling Customer Service at 713-263-8001 (Houston, Texas, USA). IFP

Draka Unveils New High-performance Armoured Power Cable



DRAKA has unveiled a new 600/1000V SWA [Steel Wired Armoured] power cable that provides enhanced circuit integrity performance to meet the demanding requirements of BS 7346-6:2005 – Components for smoke and heat control systems: specifications for cable systems. The company's new Firetuf Powerplus utilises high-performance materials to achieve the maximum 120 minute rating when subjected to integrated testing involving flame irradiation exposure, direct impact and high-pressure water spray.

The new Draka armoured power cable has been introduced to provide the superior performance characteristics required by today's sophisticated fire engineering solutions. These are becoming increasingly commonplace, following the introduction of the Regulatory Reform (Fire Safety) Order 2005, and the more widespread utilisation of fire engineering principles and techniques that call for greater reliance on complex life and property protection systems and protocols.

Enhanced circuit integrity of the new Firetuf Powerplus preserves the handling and installation characteristics of the wire armoured design. It is a development of Draka's Firetuf Power cable that was introduced to meet the requirements of BS 7846:2000 – Electric cables: 600/1000 V armoured fire-resistant cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.

The Department of Communities and Local Government's Approved Document B (Fire safety) 2006 of the Building Regulations came into force on 6 April 2007 and affects future building work in England and Wales. This specifies fire performance in accordance with BS 7346, and will impact on fire safety systems including: automatic fire suppression installations; fire detection and alarm systems; fire compartmentation; smoke control and ventilation; sprinklers and wet risers; ventilation and shutters; and firefighting lifts. Significantly, all these systems require a secure power supply that will retain its integrity in the event of fire, which highlighted the imperative need for enhanced performance power cables.

The details of the flame irradiation exposure, direct impact and high pressure water spray tests successfully completed by Firetuf Powerplus are currently documented in Annex B of BS 7346. However, they will soon be published as a stand-alone standard, BS 8491 – Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems. The new BS 7346-6:2005 standard defines the fire performance requirements of various types of fire-rated cables for maintaining circuit integrity for people – building occupants and fire and rescue personnel – property and the environment from fire.

Draka UK is the country's leading designer and manufacturer of fire performance cables, zero halogen power cables and building wires. The company is part of Netherlands-based Draka Holdings NV, which has over 9,000 employees worldwide.

Further details are available by telephone on +44 (0) 1332 345431, by fax on +44 (0) 1332 331237, and via email at firetuf@draka.com. The company's new website can be found at www.drakauk.com

LETTER

Editor's Note: I received an email from Dr Clifford Jones with regards to a recent article in the May edition of IFP Magazine. Clifford was requesting clarification on a certain point from the article by Sam Dawoud. I have published below the letter and the response from Mr Dawoud. We encourage all readers to respond to articles and authors if unsure on any points, or indeed if you have a differing opinion. We will always be happy to give you the opportunity to put over your thoughts. – DJS

Dear Sir,
The article "Offshore oil platform fire protection" in the latest IFP by S. Dawoud hopefully complements a recent article on a related topic by me in the sister journal IFF [1]. Dawoud gives "gas pool fires" as a form of combustion phenomenology at an offshore installation and possibly this term needs clarification. It seems to me that it might mean one of the following:

(i) A pool fire involving condensate which has been separated from natural gas.
(ii) A pool fire involving two-phase flow in which crude oil has "rained out" of a gas jet.
(iii) A fire involving a liquefied gas, e.g., LNG. (One would not however expect LNG to be present at an offshore installation.)

Are any of the above the correct?

J.C. Jones
Department of Engineering
University of Aberdeen
j.c.jones@eng.abdn.ac.uk

THE REPLY

Dear Dr. Jones,
Thank you for your email and it brought me great pleasure to correspond with experts in the oil Industry. I'd like to apologize for the delay in responding to your email as I've been visiting/surveying several job sites (LNG/LCNG and Ethanol plants) in the last few weeks, so I was away from my office for some time.

When stating a gas pool fires, I was referring to crude raining out from gas jet as you accurately described in item ii of your letter. To my knowledge and based on the case histories I've read, this is the most likely scenario for gas pool fires in offshore installations. In future articles and for the readers' benefits, I'll be expanding on terms that may have more than one definition and can be explained in more than one way. I'm grateful for your note.

Regards,
Sam Dawoud
RJA Group Inc.
Email: sdawoud@rjagroup.com

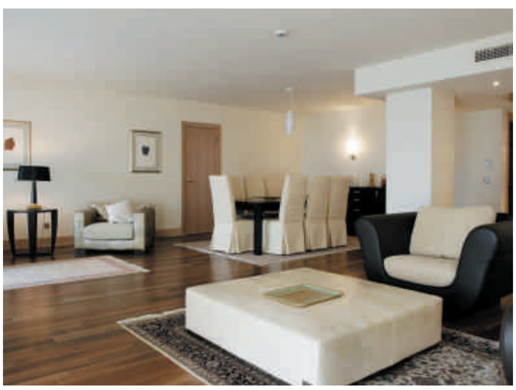
Bosch's detector and LSN technology employed to the full

- Five-star hotel equipped with optimally reliable fire detection system
- Local SecurityNetwork technology ensures maximum site protection
- Integrated fire panels for efficient surveillance and control

A comprehensive, state-of-the-art fire detection system from Bosch Security Systems is installed in the Kempinski Hotel The Dome in Turkey. Opened in 2005, the luxury hotel is located on the Mediterranean coast near the ancient harbour city of Antalya. The fire detection system, installed during the building of the hotel, comprises detectors from Bosch's well-proven 400 and 500 Series and Universal Fire panels of the type 2000 Series LSN (Local Security Network) with associated interface, alarm and control equipment.

Flush-mounted 500 Series automatic smoke detectors are installed in the hotel's Royal Suite, the General Manager's office and the automation control room ensure unobtrusive protection and do not disturb the ambient's aesthetics without compromising safety requirements. These detectors operate on the scattered-light fire detection principle with dual detection areas that ensure an extremely high level of reliability. The 400 Series smoke or heat detectors in the hotel's 157 guest rooms, public areas and 18 private villas complement the high standard of these sumptuous premises. A total of 1092 detectors are installed throughout the complex and are connected through Bosch's Local Security Network (LSN) to three Universal Fire Panel 2000 Series located in the automation room.

Bosch's LSN is a freely configurable bus security system that offers a wide choice of fire, intrusion and malfunction detectors, operator units and arming devices from multiple manufacturers. The system in use at the Kempinski Hotel The Dome is configured in a loop set-up providing automatic component identification and address assignment support. The system also allows easy connection of additional detectors if required.



The three compact 2000 Series LSN fire panels are configured in a System Ring Technology (SRT) network to providing 24/7, highly reliable and malfunction-tolerant operation. Each panel has a maximum of 96 LEDs indicating faults and/or alarms on detectors or in the hotel's 14 detector zones. A 1000 Series remote operating panel is located in the reception area to allow front desk personnel to monitor the status of the fire alarm system. In addition to the status of the fire alarm system, the panels indicate the status of the water extinguishing system, including butterfly valves, flow switches, wet alarm valves and pumps.

Zone-specific sounders and loudspeaker announcement facilities are provided in the event of alarm verification as indicated on the control panels.

The fire detection system in the Kempinski Hotel The Dome is an excellent example of a modern, comprehensive and efficient fire surveillance and control installation. Guests and staff can feel safe in this environment protected from fire hazard by a 'luxury' solution deserving of an extravagant hotel. The system was installed by Bosch's Turkish distributor for fire systems Saglam Yangin Güvenlik Ltd. Bosch has delivered similar fire detection and alarm systems to hotels in other major hotel chains throughout the world.

See www.boschsecurity.com for further information. IFP

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Innovative Solutions Protecting Innovative, Topsy-turvy Designs

Living Urban Splash style is what Chimney Pot Park is all about. Living, quite literally has been turned on its head.

Amazing designs and fresh ideas go hand-in-hand with award winning property developer Urban Splash. So their redevelopment of old Victorian terraced houses into modern, comfortable living space should come as no surprise.

Bedrooms are positioned on the bottom floor with the kitchen and living area located at the top of the house. What was the back street is now home to secure parking and better still, the area above has created space for an outdoor balcony.

This new design concept meant the steel sections within the parking area, which also support the balcony, had to be protected against corrosion and most importantly fire. LEIGHS PAINTS, who are World leaders in developing innovative fire protection solutions, supplied Firetex FX1000 to protect the steel for 1 hour.

Tom Bloxham MBE, Group Chairman and Co-Founder of Urban Splash, states:

"During the design of Chimney Pot Park, residents safety was paramount. So it was essential that we chose a world class fire protection system. Leighs Paints Firetex was the obvious solution to protect the steel members and Urban Splash would have no hesitations in using Firetex on any future projects."

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New Dual-purpose Extinguisher Offers Portable & Automatic Operation

New TOTAL® brand Tandem multi-purpose fire extinguishers have been unveiled that have the versatility to be operated both in the conventional manually-operated manner and as fixed unattended automatic extinguishers. Foam and dry powder models are available that are suitable for both Class A fires involving flammable solid materials such as wood, paper, straw and cloth, and Class B fires involving flammable liquids or liquefiable solids. Tandem powder portables are also appropriate for Class C fires involving gases, when they are used only as a portable extinguisher.

The new extinguishers are suitable for use in workshops and industrial plants, shops, offices, garages, petrol stations and mobile accommodation units. Where a Tandem extinguisher is wall-mounted for automatic operation, a special sprinkler sensor activates the agent flow and directs it at a specific fire risk to provide around-the-clock protection. Typical applications include waste containers, small storage areas, machine and engine enclosures, production equipment, and heating and air conditioning plant. Depending on the installation height, the protected area can extend to between four and six metres from the extinguisher.

When used as a portable extinguisher, delivery of the powder or foam agent is trigger-controlled. However, when used as an automatic extinguisher it delivers a "one-shot" flow when the 68°C sensor is activated. All Tandem portables are safe to use on electrical equipment up to 1000v at one-metre distance and have anti-freeze protection of up to minus 20°C for the powder models and 0°C for the foam extinguisher.

The new Tandem portables were developed at the TOTAL research and manufacturing facility in Neuruppin in Germany, and the current offering comprises a 9-litre foam extinguisher and two dry powder models – a 6 kg unit and a 12 kg unit. They are part of an extensive new range of TOTAL special-application extinguishers that are available in the UK through Express Fire in Manchester and from a country-wide network of approved TOTAL supply partners that are trained to advise, install and maintain the right extinguishers in peak condition.

Every TOTAL extinguisher is uniquely numbered during manufacture to provide a complete and reliable quality audit trail, and virtually every stage of cylinder manufacture is under the direct control of TOTAL. This includes material selection and sourcing in Europe, the use of the most advanced low-heat plasma welding techniques, fabrication, assembly and high-performance powder-coating, cylinder pressure testing of every cylinder and agent filling.

All TOTAL portables are manufactured from specially formulated steel that remains flexible after heating and welding. The one-millimetre-thick internal powder coating is widely recognised as the industry's most hardwearing surface. Every TOTAL cylinder is electrode- tested to ensure that there are no pin-point flaws in the coating, and the quality of the finish can be judged by the fact that there is a complete absence of colour fading that is a common feature of many inferior quality cylinders. Even the cylinder wall-mounting brackets are designed to ensure that there is no metal-to-metal or metal-to-wall scuffing.

Other application-specific TOTAL special portables include powder extinguishers for coal fires; antimagnetic CO_2 portables for hospitals and clinics; specially-formulated water portables for sawdust fires; wet chemical portables for cooking oil and fat fires; purpose-designed foam portable extinguishers for polar liquid fires; and specifically formulated powder portables to fight metal fires. All are guaranteed for five years, providing they are serviced from new in accordance with the appropriate regulatory standards.

Further details on TOTAL portable fire extinguishers are available from Express Fire on +44 (0)161 688 5050 or from Tyco Safety Products Fire Suppression Group on +44(0)1493 41760.

Safety Technology International (Europe) Ltd

A well known leader in the fire and security industry

Safety Technology International (Europe) Ltd; STI of Worcestershire, England and Waterford, Michigan USA is a recognised leader in the fire alarm and security industry for over 25 years. STI manufactures and markets more than 300 products to help stop false fire alarms, vandalism and theft of fire and security equipment.

Put a stop to false fire alarms

Amongst the many products STI manufactures and distributes is the Stopper®.

A unique, tough, protective cover, which will help stop pranksters and vandals causing false alarms. The clear, polycarbonate cover retrofits over a range of alarm devices without hindering legitimate operation. It is extremely tough and will take the severest of knocks in its stride.

Proven in use in virtually every kind of public building around the world, the Stopper® is an active deterrent, which will dramatically reduce or even eliminate product misuse.

With a simple, 4 screw retro fit, wire-free installation, the Stopper® fits virtually all manual call points. It is available in many different models and can accommodate flush or surface applications.

The Stopper can be fitted with an integral sounder, which emits a piercing 98 dB when the cover is lifted drawing immediate attention to the area.

An effective deterrent against unauthorised exits/entries

The Exit Stopper is a self-contained tamperproof electronic emergency door alarm system providing a highly effective, extremely versatile and inexpensive method of discouraging unauthorised use of emergency exit doors. The device will also signal an unauthorised entry, and is ideal for hospitals, stores, restaurants, offices, factories and other public buildings.

The Exit Stopper incorporates a highly visible stop sign design, which has proven to act as a deterrent in itself. If the protected door is opened, the electronic Exit Stopper emits a piercing warning alarm. Once the door is closed, a number of reset options are available including an automatic feature. A variety of alarm duration and automatic reset features are available. A key operated override facility will silence the alarm and allow authorised exits.

The Exit Stopper is available in red or green and is fitted with a 9V PP3 alkaline battery. This highly versatile device can be installed on wooden, glass or steel doors, with left, right or top door mounting options and can accommodate single and double door applications. The unit can also be remotely installed.

Stop fire extinguisher misuse with our 98 dB deterrent

If you are fed up with replacing or recharging your fire extinguishers, this sturdy, tamperproof, self-contained device is the answer. The Extinguisher Stopper has proven highly effective in helping stop theft, misuse or vandalism of fire extinguishers.

If the protected fire extinguisher is moved from its normal position, an integral sounder emits a piercing alarm. Its highly visible stop sign design discourages wrongful use.

The Extinguisher Stopper is easy to install and a deactivation cable is supplied for ease of servicing the extinguisher. The Extinguisher Stopper is supplied complete with an operating cable kit and a 9V PP3 alkaline battery.

Anti vandal cages designed to protect essential fire & security equipment from vandalism and damage

STI manufacture and stock a comprehensive range of cages and provide a custom build service for those special applications. The cages are designed to protect a wide range of security devices including CCTV, smoke detectors, fire bells, emergency lighting, motion detectors and beacon/sounders from vandalism.

Constructed from plastic coated, 9 gauge galvanised steel rod, the cages can cope with the severest of abuse from vandalism or accidental damage.

Installation fixings are provided, but where additional security is required, tamper resistant screws and matching bits are available.

No more broken glass – the way forward in call point technology

The ReSet is a unique manual call point that mimics the feel of breaking glass whilst offering the user the benefits and environmental advantages of a resettable operating element.

Tested and approved to EN54-11 (cert. no. 653a/01), the ReSet has a simple, yet ingenious patented mechanism which consist of a rigid plastic operating element and an over centre spring mechanism. This arrangement provides a real action on operation and simulates break glass activation.

An activation indicator drops into view at the top of the window after the ReSet has been operated. The unit is then simply reset with a key and is ready for re-use straight away.

The ReSet is compatible with most conventional fire alarm systems. It is safe for use in areas were glass cannot be used e.g. food processing plants and swimming/leisure centres.

As the unit can be simply reset it provides an ideal solution for areas that suffer from a high number of false activations such as schools, shopping centres and other public places. IFP

For further information on STI's product range contact:
freephone 0800 085 1678 or visit
www.sti-europe.com

New Skum™ Foam Delivery Systems Unveiled

Tyco Safety Products Fire Suppression Group has unveiled a number of groundbreaking pieces of SKUM™ brand foam hardware: the new remotely controllable FJM-EL fog/jet monitor range, and the new HG high-expansion foam generators. They join a line-up of dependable and efficient foam fire protection solutions that are globally favoured for high value, high risk petrochemical, aviation, marine and power plant applications.

The new FJM-EL monitors are powerful additions to the established SKUM FJM range. All three models – the FJM-100 EL, the FJM-150 EL, and the FJM-200 EL – offer exceptional flow performance, incorporate electric motor driven elevation and rotation and solenoid valve operated fog/jet pattern adjustment. However, it is the FJM-EL's remote control operation that really sets them apart as fix-mounted monitors designed for the safe delivery of foam or water, either as a solid jet or a fog pattern.

The FJM-100 EL, with the built-in inductor option, delivers up to 6,000 litres of water a minute to a maximum jet throw of 80 metres, while the FJM-150 EL increases this to 11,700 litres a minute to a distance just short of 90 metres. The top performing FJM-200 EL increases the reach to 120 metres and the flow to an impressive 2,000 litres a minute. The foam capacity for each of the models is 340 litres a minute, 585 litres a minute and 600 litres a minute respectively.

These lightweight and compact balanced-design monitors all incorporate an electrical junction box, low-friction bearings for easy manoeuvrability, and feature corrosion-resistant construction, which makes a major contribution to the monitors' reliability, while minimising the maintenance requirement. All include a manual override option. Other optional components include a control and operating panel, which can be either the standard FJM model or be custom-built, suction hose and valve, and explosion protected EEx (e) and flameproof EEx (de) electrical equipment.

The new HG stationary high-expansion foam generators are part of the HOTFOAM™ system developed by SKUM primarily for protecting enclosed spaces such as warehouses and distribution centres, flammable material production facilities, tunnels, transformer stations, engine rooms and pump rooms. Located inside the protected space, the HG generator has no moving parts and does not require power in any form, using the air and smoke from the fire itself to generate foam bubbles using a specially-formulated SKUM foam concentrate. The stainless steel HG generators are lightweight – the HG-15 weighs just 5 kg and the HG-25 weighs 10 kg – easy to install, and deliver 18 and 60 cubic metres of foam a minute.

Further details on SKUM – the Swedish word for foam, which is pronounced "skoom" – solutions and expertise can be found at www.skum.com, or are obtainable by email on tspmarketing.emea@tycoint.com, by telephone on +46 303 57700, or by fax on +46 303 58200.

LETTER

Editor's Note : In the last issue of IFP there was an error in supply of a table within Meg Godfrey's article. This was brought to our attention by a reader and Meg Godfrey has provided the letter and corrected table below. – DJS

Mr. Van WiJk,

You are entirely correct, the values identified as IDLH's are, indeed, TWA's – OSHA-specified TLVs. I must apologize to both you and the readers of International Fire Protection magazine for including the wrong table in my article. The correct table, comparing IDLH to 10% LEL is shown below:

Compound	LEL by volume	LEL (ppm)	10% LEL (ppm)	IDLH (ppm)
Ammonia	15%	150,000	15,000	300
Arsine	5.10%	51,000	5,100	3
Benzene	1.20%	12,000	1,200	500
Diesel	0.70%	7,000	700	13 (TWA)
Methyl Ethyl Ketone	1.40%	14,000	1,400	0.20 (STEL)
Styrene	0.90%	9,000	900	700
Toluene	1.10%	11,000	1,100	500
Trichloroethylene (TCE)	8%	8,000	800	100
Vinyl chloride	3.60%	36,000	3,600	1 (TWA)
Xylene	1.10%	11,000	1,100	100

As you can see, the point still stands: these compounds are deadly at concentrations well below LEL alarm levels.

Thank you for your careful reading and for bringing this error to my attention.

Warm regards,
Meg Godfrey
Manager Technical Services, RAE Systems, Inc.
Office: (408) 952-8251 Mobile: (510) 459-8397 www.raesystems.com

Voice Plus: Clarifying the Message

Alarm sounder manufacturers tend to populate their products with a multitude of alarm tones in order to give them the widest possible appeal to the broadest spectrum of users.

The Roshni range from Fulleon, although targeted mainly at the fire protection market, has always had 32 tones to cover other uses such as security and general signalling duties. Considering the many and varied uses to which sounders can be put, it is a little surprising to find that only 10 or so of the 32 tones available on the RoLP are regularly used. The reasons for this are open to debate, but my view is that the alarm tones, with the exception of two or three country specific uses, have no clearly defined meaning and hence the same tone can be used in many environments for quite different purposes. This situation can and does lead to confusion and limits the public's response to simple alarm sounders.

Voice Messaging: the Challenges

Putting voice into sounders does however present a more complex challenge for both the system designer and the manufacturer. As postulated above, sounders can get away with a fixed number of alarm tones as people need to be taught what the tone means, but when it come to voice the precision offered by the message content can be a double edged sword as both language and sex get in the way!

Voice Messaging: The Solution

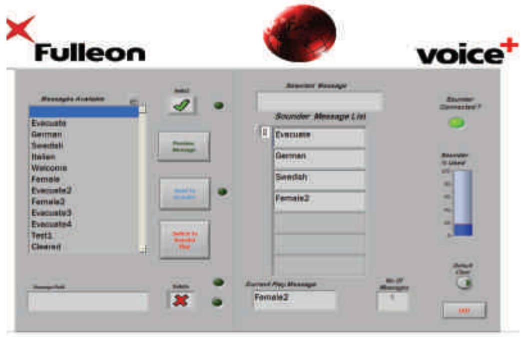
The solution chosen by Fulleon to cope with the message diversity is to provide in the sounder, as a default, 16 of the most popular messages, with the option for simple management and upgrading when required.

The technology that Fulleon had been using for voice sounders required the messages to be stored on an EPROM that had to be physically changed to accommodate revisions to the messages stored in the sounder. This was not convenient as the EPROM could only be programmed once and on sites where messages were changed from time to time the cost of the EPROMs became a significant overhead.

We are now familiar with the culture of music downloads and the ease of storage on to portable players, mobile phones or PCs; the ready availability of these techniques and allied technologies has enabled the migration of similar user friendly methodology to Fulleon's Voice+ sounders.

Voice +

The development of Voice+ covers two areas; the first is the sounder which takes much of Fulleon's current technologies to give a capacity of at least 16 messages, coupled with a lower power requirement, wide operating voltage and the option of an integral LED beacon. The second element is the



user-friendly interface that allows the message array in the sounder to be managed and manipulated without anything more than basic computer skills.

Transferring messages

Like a music player, the message list can be built up on a PC and then transferred to the sounder using the PCs USB port. Compiling the message table on a PC brings advantages, such as the facility to preview each message, the ability to store specific message tables for particular customers or sites and the ability to obtain new messages from Fulleon or other approved sources in a format that can be directly transferred to the sounder.

Where a system needs an extension, the message list can be copied from an existing sounder to the PC and then replicated into the new sounders ensuring that operational uniformity is maintained and, more importantly, that the messages synchronise between units. This could potentially be done locally by an approved agent without the need to refer back to Fulleon for a master message list.

With this ease of programming from a PC there are other issues to be considered, such as security and the risk of tampering. The Fulleon Voice+ sounders deliberately do not provide a direct USB connection to the sounder. For life critical applications it was considered that the risk from idle hacking by anyone with a PC, regardless of any software security, was too great so the link to the PC requires a unique interface between the USB port and the sounder. Approved users of the technology will be provided with the interface as part of the programming package.

Future Developments

So, voice messaging is certainly here to stay. It offers significant advantages over tone based sounders, with a clarity and capacity for individual messages which cuts through the potential confusion of what action is required on hearing any given tone. IFP

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Website: www.fulleon.com

Smokefree Zone

Kingspan Insulation manufactures and supplies of some of the most thermally efficient and technically advanced roof, wall and floor insulation products on the market today.

The products have been used in buildings throughout all construction sectors, including hospitals, schools and leisure centres as well as housing, industrial and commercial buildings. Not only do they provide excellent levels of thermal performance, they can also contribute to the overall fire safety of a building.

As a leading manufacturer, Kingspan takes its market responsibility very seriously and is committed to an ongoing programme of research and development to ensure optimum solutions for the needs of the industry it services.

Obviously the primary function of insulation is thermal performance, and one of the most thermally efficient insulants readily available today is rigid phenolic insulation. With a thermal conductivity as low as 0.021 W/m.K, the exceptional thermal performance of rigid phenolic insulation means that it can utilise the thinnest possible insulation board to achieve required U-values. This makes it an increasingly popular choice because of the growing demands to maximise the energy efficiency of buildings without having too great an impact on either footprint or structural loading.

Apart from premium thermal performance there are other advantages too: rigid phenolic insulation will not sag or slump; it is resistant to the passage of water vapour, unaffected by air movement and carries no condensation risk. This means that it will continue to perform at an optimum level over the life of the building. It is lightweight, has no loose fibres, and is easy to handle and install, requiring no specialist handling or safety equipment.

But just as importantly, rigid phenolic insulation can potentially limit fire and smoke damage, which can result in less structural damage, lower remedial costs and most crucially, greater chance of escape for occupants.

Let's look at a practical example: in a rainscreen-clad building over 18 metres tall, a careless cigarette, an act of arson, an electrical fault could all be sufficient to start a fire. Combine that with the chimney effect in the ventilated cavity behind a rainscreen and the risk of fire spread may become catastrophic.

However, if a rigid phenolic insulation product such as Kingspan Kooltherm K15 Rainscreen Board has been used, it can provide significant fire resistance and can help to maintain the integrity of the structure. This positive contribution to the robustness of the building could buy valuable time for any occupants to escape and for the fire service to get things under control should a serious fire occur, thereby potentially saving lives and reducing any rebuild costs.

By utilising the right insulation behind a rainscreen, the risk to both occupants and the building itself from fire can be greatly reduced whilst the energy efficiency of the building is enhanced. The wrong material may do more than lead to greater energy bills than necessary, it could cost lives.

Kingspan Kooltherm® K12 Framing Board provides approved fire performance at Whitecross School in Hereford, England

Kingspan Kooltherm K15 has been successfully tested at the Building Research Establishment to BS 8414-1: 2002. As a result, when assessed in accordance with BR 135, it is acceptable for use above 18 metres in accordance with the English, Welsh, Scottish and Northern Irish Building Regulations/Standards.

Kingspan Insulation manufactures a whole range Kooltherm® premium performance CFC/HCFC-free rigid phenolic insulation products. Apart from Kingspan Kooltherm® K15 Rainscreen Board, for external wall applications there is the Kingspan Kooltherm® K5 External Wall Board for use behind polymer modified renders. For insulated dry-lining plasterboard Kingspan offers Kooltherm® K17 and K18 Insulated Dry-lining Boards, and Kooltherm® K12 Framing Board provides insulation for timber and steel framing systems. These solutions can easily achieve U-values of 0.27 W/m^{2}K. Likewise, Kingspan Kooltherm® K10 Soffit Board can solve floor U-values of 0.22 W/m^{2}K and below.

All products in the Kingspan Kooltherm® K-range achieve a Class O/Low Risk fire rating to the Building Regulations/Standards and less than 5% smoke obscuration when tested to BS 5111.

With such materials available specifiers and contractors alike can take comfort in the fact that they can seek simple insulation solutions which have an intrinsic resistance to the spread of fire and negligible smoke obscuration. Moreover, rigid phenolic insulation will comfortably fit within the footprint, keeping design costs down and providing a consistent energy efficient envelope that will perform for both present and future generations.

Kingspan Insulation offers an extensive range of insulation solutions for both newbuild and refurbishment projects. Specifiers, stockists and contractors are supported with a comprehensive and free technical advisory service. IFP

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whoever, wherever, whenever...

...be prepared for fire!

There are over 100 years of design and manufacturing expertise behind every TOTAL Portable Fire Extinguisher, so reach out with complete confidence for a range of solutions to cover all types of fire risk.

TOTAL portable fire extinguishers are safe and reliable, as well as being simple to operate. The whole range features innovative improvements in fire fighting performance, coupled with the very highest levels of build quality and backed by our 5-year product warranty.

Continuous research and development keep TOTAL Portables at the leading edge of technology. Stringently tested and approved, TOTAL's portfolio of extinguishers meets all national performance and approval standards for complete user confidence.

Don't chance it! Choose TOTAL.

Five good reasons why you should choose a Total solution:

- **Our pledge** .... 5 years warranty
- **Reliability** .... Designed for best performance and ease of use
- **Superior product** .... Highest quality European manufacture, assembly and testing
- **Assurance** .... A TOTAL portable solution for all types of fire risk encountered
- **Third party approvals** .. BS EN3, BSI Kitemark®; BAFE listing; Marine 'Wheelmark'

TOTAL fire extinguishers for all fire risks, including :

- Electrical
- Paper
- Fuel
- Tar
- Natural gas
- Paints
- Sawdust
- Wood
- Straw
- Methane
- Acetone
- Metal
- Fats
- Textiles
- Oils
- Propane
- Propanol
- Cooking oil
- Solvents
- Alcohol
- Methanol
- Hydrogen
- Coal Dust and Mining
- Magnetically Sensitive Equipment

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Intensive Care

Hospitals and healthcare buildings have unique fire safety challenges, as a fire can be particularly serious because of the difficulties and dangers associated with the evacuation of patients in an emergency. Here John Allen, EMEA Marketing Director for Tyco Safety Products Fire Suppression Group looks at the latest suppression options – both fixed and portable – to enable patients and staff to be "defended in place".

By John Allen

EMEA Marketing Director, Tyco Safety Products Fire Suppression Group

When devising fire engineered solutions for hospitals and healthcare buildings, fire engineers understandably take a different approach than the one they would adopt for most other buildings. In the majority of cases, personal safety – as opposed to property protection – depends on the swift, orderly and safe evacuation in the event of an emergency. Not so with hospitals.

Even with the emphasis being on horizontal rather than vertical evacuation, mass evacuation is not a realistic option. It would be too stressful, too dangerous and too time consuming. Patients may be in intensive care, elderly, disabled, undergoing surgery, drug dependent; they may be attached to immovable monitoring, breathing or other life-support equipment. The list is seemingly endless. Inevitably, what fire engineers working on evacuation strategies refer to as the Required Safe Egress Time may be greater than the Available Safe Egress Time. So, fire safety for healthcare buildings must be based on a "defend-in-place" strategy.

This places much greater reliance on both the fire detection and fire fighting systems and protocols. In these circumstances, fire detection and alarm, fire suppression, and the passive fire safety aspects of the building must all work together to avoid, where at all possible, the need to evacuate patients. This demands particularly skilful fire engineering solutions, coupled with the use of the most reliable and quick acting suppression systems and highly trained staff. At the same time, there is a need to protect expensive medical and surgical equipment, to safeguard vital clinical records, and to ensure that the suppression agent does not itself endanger life or cause unnecessary alarm and panic. Finally, there is an imperative need to ensure, once a fire has been put out, that the hospital can return to full working order in the shortest possible time.

If those constraints are not enough to contend with, there is growing pressure to use suppression agents that do not adversely impact on the environment.

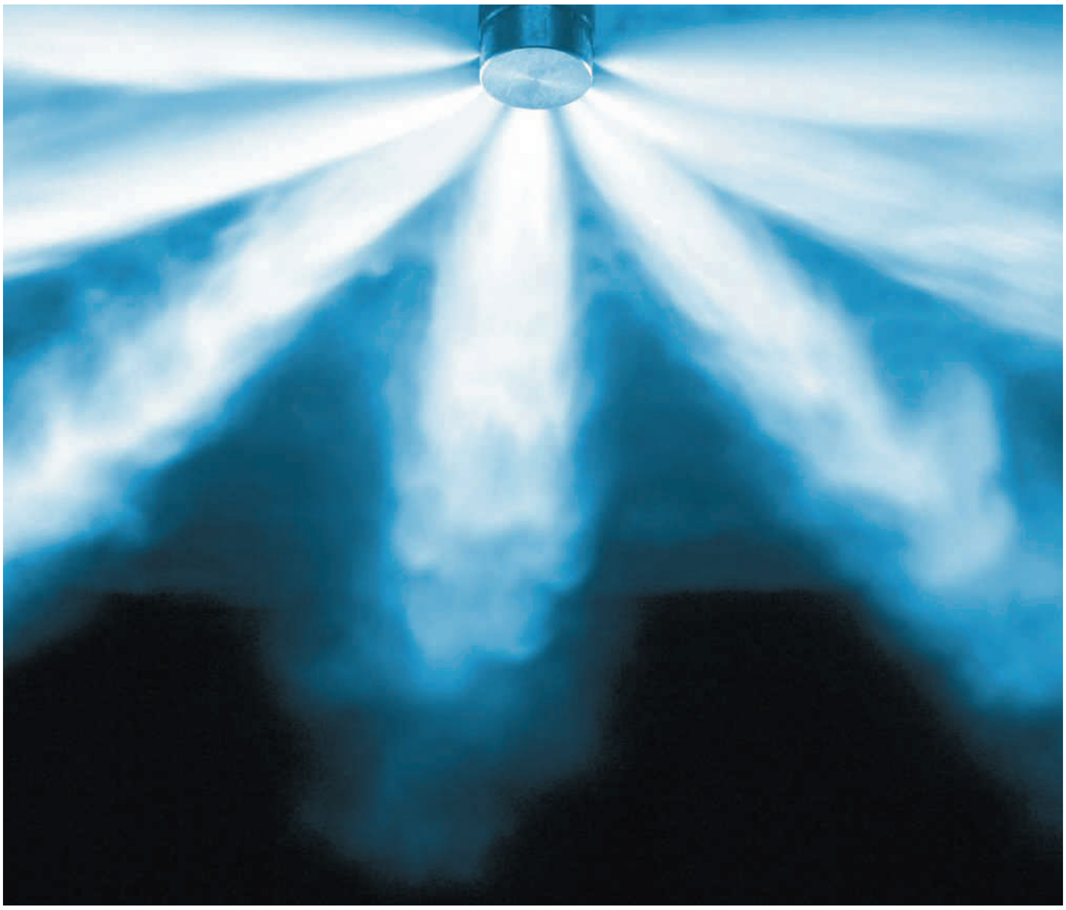
First aid

So, "first aid" firefighting measures are given a great deal of consideration by hospital fire safety officers, both in terms of the equipment that is chosen and the training provided to the hospital staff. Considerable reliance is placed on the selection and use of portable fire extinguishers, and this is an area where concerns over the poor quality of some of the portables on the market are being more frequently, and rightly, heard. If a portable extinguisher fails to perform in a commercial building, the member of staff frequently has the option to flee, whereas a failed portable in a nurse's hands leaves incapacitated patients at severe risk.

Quality is, therefore a major issue, as is ensuring that there is a proper match between the risk and the type of extinguisher chosen to safeguard against it.

In reality, hospitals contain several different types of risk. In addition to the common fire risks in a hospital, such as Class A fires that involve flammable solid materials such as wood, paper and cloth, Class B fires involving flammable liquids or liquefiable solids, and Class C fires involving gases, there is a need for a number of special risk portables. These include: antimagnetic portables for use near sensitive electrical equipment; wet chemical portables for hospital kitchen cooking oil and fat fires; and purpose-designed foam portables for polar liquid fires. These are now available in the UK under the TOTAL® brand and elsewhere under the NEURUPPIN® brand.

The new antimagnetic portable fire extinguisher



is specifically designed for hospitals, healthcare centres, clinics and other locations where magnetic interference could potentially damage sensitive equipment or put equipment's performance in doubt or at risk. It is a 5kg CO_2 [carbon dioxide] extinguisher that is suitable for Class B fires – flammable liquids or liquefiable solids – and is constructed entirely from non-magnetic materials. The use of aluminium for the cylinder body also ensures that, at an all-up weight of 12.5kg, the TOTAL and NEURUPPIN portable is lighter than conventional Class B extinguishers and so is more easily handled by nursing staff.

Not all hospital fire risks can be addressed using portable extinguishers; some areas can be protected effectively only by installing a fixed system.

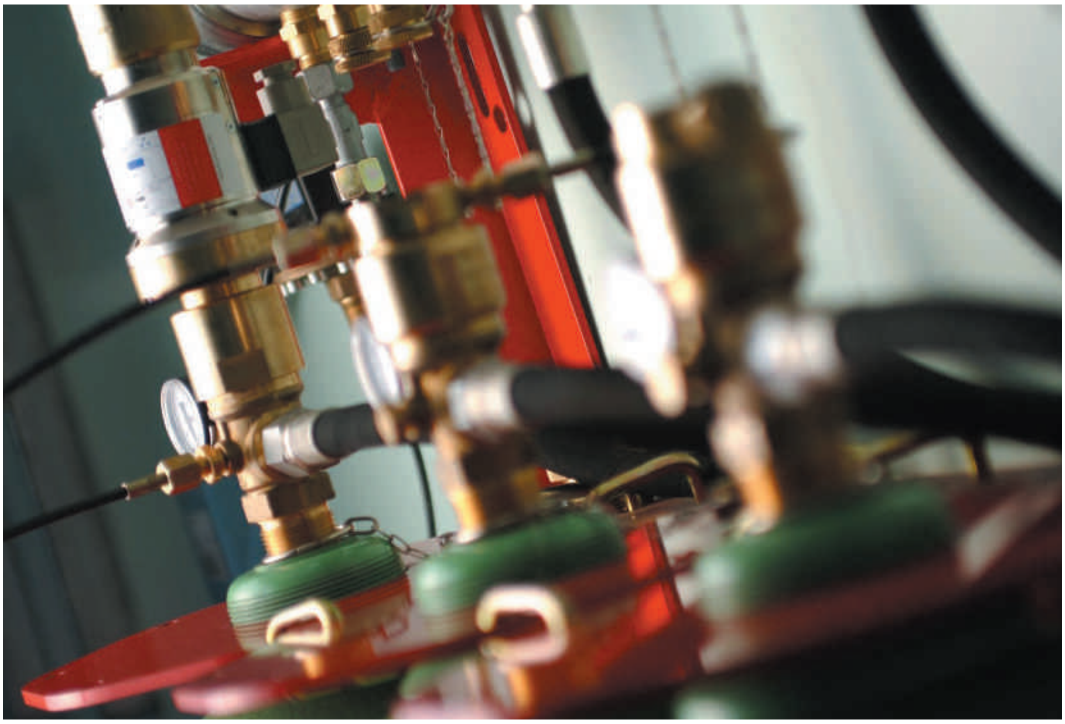
The new portable designed to fight cooking oils and fat fires in kitchens is a major step forward in hospital kitchen fire safety. These fires can erupt into flames in an instant, so a unique feature of the new 6-litre portable is its ingenious nozzle applicator that enables the user to apply the wet chemical agent while safely remaining three or four metres away from the fire. Propelled by nitrogen, the special Tyco-developed agent is effective on all Class F cooking oils and fat fires, plus it is equally efficient on Class A fires involving flammable solid materials often found in kitchens.

Hospitals also use an array of polar liquids, including alcohol that, if they catch fire, cannot be effectively fought using a conventional foam extinguisher. So the new TOTAL and NEURUPPIN portables use a specially-formulated foam agent developed by Tyco, and incorporate a nozzle designed to deliver the optimum foam density. The new 6-litre portable also has a major environmental "plus", as the foam concentrate is completely encapsulated within a cartridge inside the extinguisher. This maximises the life of the concentrate, allows the cartridge to be environmentally-friendly recycled, and ensure swift and easy servicing of the extinguisher. The cylinder is pressurised only when in use and the foam is propelled by CO_2.

Health assured solutions

Not all hospital fire risks can be addressed using portable extinguishers; some areas can be protected effectively only by installing a fixed system. While what might be described as "public" areas, such as recovery wards, corridors, waiting rooms and general treatment areas are sometimes protected by water sprinkler systems, the potential for electrocution due to the large amount of electrical equipment and the electrical conductivity of water needs to be borne in mind. So, many facilities are best protected using a fixed gaseous suppression system. In particular, these include medical record stores and archives, areas containing sensitive, expensive or life-support-critical equipment that is essential to patient care, and essential computer suites and control rooms.

There are a number of systems on the market that, from a technical firefighting standpoint, are suitable for protecting such risks. However, the list



shortens considerably if two other factors are taken into consideration – the health risk to occupants and environmental concerns.

CO_2 systems have, quite rightly, been regarded as a first-class fire suppression agent for many years, unfortunately though, when used at design concentration, CO_2 is potentially lethal to room or enclosure occupants, so are appropriate only for use in unoccupied areas. This leaves inert gas systems and the new generation of environmentally acceptable chemical suppressants. Hydrofluorocarbons – more frequently known as HFCs – were considered to be an acceptable option following the Halon phase-out, but these are now listed in the Kyoto Protocol's basket of undesirable gases, plus they all have global warming potential. Certainly they do not have the "clean" credentials of either the i3® inert gas or the SAPPHIRE® fluid-based suppression system.

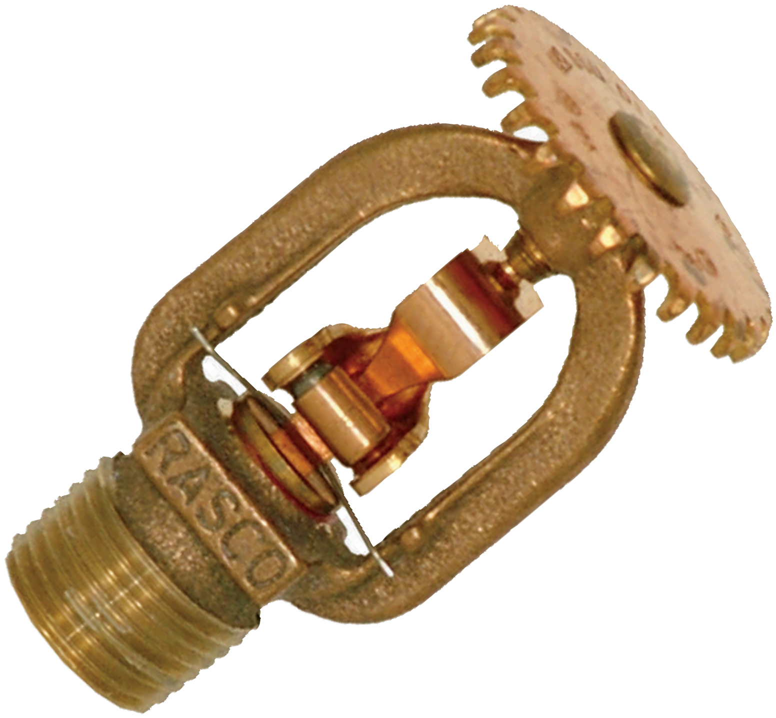
i3 is suitable for total flooding applications; it is non-toxic, non-corrosive and odour-free, zero-ozone-depleting, and has zero global warming potential. It is ideal for protecting hospital computer suites, sensitive electronic medical equipment and archive stores. Its many user benefits include being fast acting, having a low life-cycle cost, being electrically non-conductive and having a negligible impact on the environment. Significantly, where space is a major consideration, i3 has a smaller footprint than traditional lower-pressure inert gas technology. It is a 50:50 mixture of two naturally occurring gases – Argon and Nitrogen – that have a similar density to air, so the protected space retains its concentration far longer than the now-banned Halon 1301.

i3 extinguishes a fire by reducing the ambient concentration level of oxygen to approximately 12.5 percent, which is below the level required to support combustion. Its appeal for use in occupied spaces is further enhanced by its being an invisible gas that does not obscure vision. It is stored in high-pressure steel containers with an operating pressure of 300bar.

SAPPHIRE utilises 3M™Novec™ 1230 fluid, and shares with i3 many of the same user benefits and environmental characteristics. It too has a negligible impact on the environment and insignificant global warming potential; it has zero-ozone-depleting potential and a remarkably low atmospheric lifetime of just five days, so does not have any appreciable impact on climate change. The fluid is stored in containers as a low vapour pressure fluid that transmutes into a colourless and odourless gas when discharged. Significantly, unlike other fluid fire extinguishing agents, it can be used with absolute confidence to suppress fires involving electronic equipment. It can also be used to protect document archives as, even in its concentrated form, the Novec 1230 fluid does not damage paper-based records.

i3 is suitable for total flooding applications; it is non-toxic, non-corrosive and odour-free, zero-ozone-depleting, and has zero global warming potential.

An important feature is that the Novec 1230 fluid is not included in the basket of greenhouse gases identified by the Kyoto Protocol, which underpins its sustainability and makes it an attractive and cost-effective long-term solution for hospital administrators. This is, and is sure to remain, an important consideration, as hospitals and other healthcare providers naturally strive to maximise the percentage of their budgets that are devoted to patient care. There is though a growing realisation that it is worth investing in build quality and solution sustainability. Not only does this result inevitably in the lowest possible lifetime cost, it is also the best insurance against a minor fire developing into a major conflagration with potentially serious loss of life. IFP



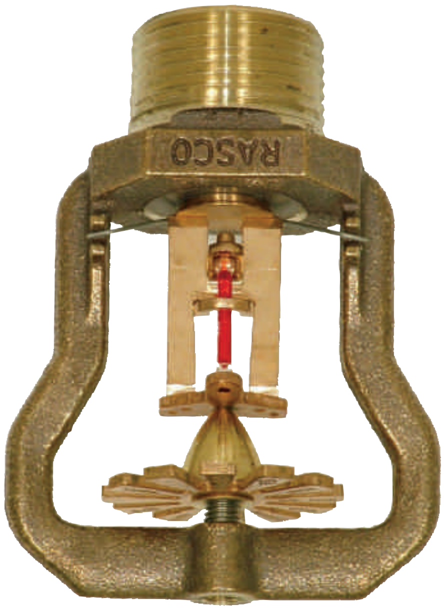
The Evolution of Modern Automatic Fire Sprinklers

The automatic fire sprinkler industry has gone through an exponential expansion of product choices over the last 25 years or so. The lay out technician has literally thousands of sprinkler styles, finishes, temperatures, response times and orifices to choose from to incorporate into the fire sprinkler shop drawings.

By David L. Asplund, P.E.

Hazard classifications and commodities have evolved dramatically over the same time period. What was once a simple mercantile occupancy (ordinary hazard group 2) can now be a complex storage protection scenario due to the way the retailer displays his goods. Our modern society has also seen a dramatic increase in the use of plastics in items for every day use. Plastics are not only used in the manufacture of products for our busy 21st century lives, but nearly everything seems to be cartoned in polystyrene packaging. To understand where we are today with the current basic categories of modern automatic fire sprinklers, I find it helpful to look to the past to see how the automatic fire sprinkler has evolved through the years.

The first automatic fire sprinklers appeared in the early to mid 1870's. They consisted of a nozzle device with many perforations in the outlet, similar to the cap on a salt shaker. The nozzle was then covered with a solid metal cover that was soldered in place. The fire would have to create enough heat to bring the entire device, including the water inside the nozzle, to the melting point of the solder. These early sprinklers had very high thermal mass and extremely slow response times. The first great improvement of the automatic fire sprinkler occurred in the early to mid 1890's. The nozzle orifice was covered with a disc that was held in place by a lever mechanism. The two levers holding the orifice disc cap in place were held together by a fusible link. This fusible link is two pieces of bronze material held together by eutectic solder. The fusible link was located away from the nozzle waterway and dramatically reduced the thermal mass and greatly increased the response time of the sprinkler. When the fire created enough heat to bring the link to the melting point of the eutectic solder, the link pieces would separate causing the levers to release the orifice disc cap and water would then discharge. The perforated cap was replaced with a *deflector* located at the end of the sprinkler frame. These sprinklers are called *standard response conventional*



spray sprinklers, they have ½" diameter NPT male threads and ½" nominal diameter discharge orifices with flow constants of K = 5.6. These *conventional deflector* sprinklers remained the standard of quality fire protection for the next 60 years.

In 1953 the National Fire Sprinkler Association (NFPA) revised their pamphlet #13 to require the use of *standard spray deflectors* on automatic fire sprinklers. This was the beginning of having automatic fire sprinklers with directional orientation. **Standard response, standard spray sprinklers** are grouped in a category called **Density Area Control** Mode sprinklers. The four types of *standard spray deflectors* are called *upright, pendent*,

The residential fire sprinkler spray discharge pattern has a requirement for a strike point much higher on the wall surface than the standard spray sprinkler.

vertical sidewall and *horizontal sidewall*. This remained the pinnacle of automatic fire sprinkler protection for approximately the next 30 years and continues to be the most common form of protection today. During this same 30 year time frame, releasing mechanisms improved from the link and lever to a smaller and faster center strut solder capsule design and glass bulb closures were also introduced. Standard response sprinklers are also available with *extended coverage deflectors*.

In the early 1980's, much research was being conducted on the residential fire scenario. The residential fire problem differs from the commercial fire problem because there is much less fire loading in residential occupancies than in commercial occupancies. The intent of the **residential fire sprinkler** is to prevent flashover and to create an extension in egress time for the buildings occupants. The residential fire sprinkler differs from the *standard response, standard spray sprinkler* in that they have a much faster response time (i.e. a low thermal mass releasing element), they utilize a *residential deflector* that creates a much flatter spray pattern and, usually, they have a much smaller orifice for reduced water flow. The residential fire sprinkler spray discharge pattern has a requirement for a strike point much higher on the wall surface than the standard spray sprinkler. Even though there is a reduced amount of water discharge from the residential fire sprinkler, it still does an excellent job of washing down the walls to cool their surface temperature in order to prevent flashover in the room of fire origin. The residential fire sprinkler is a life safety sprinkler and not a control mode sprinkler! The design intent of the residential fire sprinkler is to provide 10 minutes of egress time for the building occupants. The residential fire sprinkler must pass a much different fire test than the *standard response, spray sprinkler* and they have different criteria for design and installation which is governed by the NFPA standards 13D and 13R.

The early application of water on fires, while they are still in their incipient stage, is a concept not only used for the residential fire. Expanding on this concept for more challenging fire scenarios brings us to the next quantum leap in the evolution of the modern automatic fire sprinkler, the *Early Suppression Fast Response* or the *ESFR* sprinkler. *ESFR* sprinklers are **Suppression sprinklers** and they are not density area, control mode sprinklers! As the name of these sprinklers imply, they have a fast responding, low thermal mass releasing element and the design intent is to suppress the fire, not just control the fire. *ESFR* sprinklers have a very large discharge orifice and the deflector is designed to create a high degree of downward momentum or thrust of the water discharge to penetrate high piled storage arrays. *ESFR* sprinklers are intended to eliminate the need for intermediate levels of fire sprinkler protection in storage racks. Suppression sprinklers have different hydraulic design criteria

from density area, control mode sprinklers. The hydraulic design of *ESFR* sprinklers is based on a starting operating pressure, determined by the building elevation and storage height and type of commodity, with the 12 most remote sprinklers flowing simultaneously as the hydraulic design area. The specifics of spacing, location, obstruction criteria and hydraulic design are covered in section 8.12 of the NFPA #13 standard, 2002 edition.

The NFPA #13 standard was revised in 1996 to require **Quick Response Sprinklers** in all buildings with light hazard occupancy classification. A reduction in the hydraulic design area is given for buildings with ceiling heights 20 feet or less,

Many standard response sprinklers, such as extended coverage ordinary hazard (ECOH) sprinklers, have fast responding (low thermal mass elements) in order to pass their fire tests.

under section 11.2.3.2.3.1 of the 2002 edition. This is another example of the benefits of the early application of water on fires while they are still small. The term quick response refers to the listing of the entire sprinkler (including spacing, density and location) not just the fast responding releasing element! Many *standard response sprinklers*, such as extended coverage ordinary hazard (ECOH) sprinklers, have fast responding (low thermal mass elements) in order to pass their fire tests. The 2002 edition of the NFPA #13 standard, section 3.6.1 defines quick response sprinklers as having a response time index (RTI) of 50 (meters-seconds)$^{1/2}$ or less. Quick response sprinklers are available with standard spray deflectors, but they are also available with extended coverage deflectors.

In 1999, the NFPA #13 standard was revised to add section 5-4.1.2 which requires sprinklers that protect storage occupancies (i.e. solid piled or rack storage greater than 12 feet in height) to have minimum nominal K factors of 8.0 for water application rates, or *densities*, from 0.21 gpm/sq. ft up to 0.34 gpm/sq. ft. For water application rates (*densities*) greater than 0.34 gpm/sq. ft, a sprinkler with a minimum nominal K factor of 11.2 must be used. Sprinklers with these large orifices and high K factors are called **Storage Sprinklers**. Storage sprinklers are standard response, density area, control mode sprinklers and can have both standard spray deflectors and extended coverage deflectors.

To summarize, this article has introduced the three general categories of automatic fire sprinklers as; **density area control mode** sprinklers, **suppression** sprinklers and residential sprinklers. **Density area**, **control mode** sprinklers have six subcategories:

1 Standard response, standard spray
2 Standard response, extended coverage
3 Quick response, standard spray
4 Quick response, extended coverage
5 Standard spray storage
6 Extended coverage storage

These subcategories are also available in a variety of options like chrome plated or white painted finishes, solder capsule link or glass bulb releasing mechanisms in temperatures ranging from 135°F to 360°F and nominal K factors (i.e. discharge orifice) from 1.8 to 25.2. In turn, each of these subcategories can be further specified by adding appurtenances like recessed escutcheon, dry or non-freeze barrels, head guards or water shields (for intermediate level protection in storage racks).

Storage sprinklers are standard response, density area, control mode sprinklers and can have both standard spray deflectors and extended coverage deflectors.

There is also a relatively new category of automatic fire sprinkler in use and under development today. These automatic fire sprinklers are called **Specific Application Control Mode Sprinklers** or **SACM Sprinklers**. These sprinklers, as their name implies, will have applications for very specific storage commodity classifications and very specific storage arrays. They will have to pass fire tests that are more stringent than general fire tests for **density area**, **control mode** sprinklers.

They say that the only constant in life is change, so in conclusion, from looking at our past and through the evolution of the automatic fire sprinkler to modern times, what we can expect in the future is continual change in our industry. IFP

David L. Asplund, P.E., is a 30 year veteran of the fire sprinkler business. David has been employed by Reliable for the past 10 years. He has held several positions at Reliable including Regional Salesman, Technical Services Manager and Regional Sales Manager. His current title is Director of Technical Services. Prior to his career at Reliable, David spent 20 years as a fire sprinkler contractor for various companies in the western part of the United States. David has a Bachelor of Science Degree in Mechanical Engineering from the University of Colorado and is a licensed fire protection engineer in the states of Colorado & Washington. He has been NICET certified as a fire sprinkler layout technician and is a full member of the Society of Fire Protection Engineers.

The LASTFIRE Up

The Industry Forum on Storage

Approximately 12 years ago, recognising the need to have validated data on the risks associated with fires in large, open top floating roof storage tanks, 16 oil companies joined together to form a project group to thoroughly investigate the issue. The project was known as **LASTFIRE – Large Atmospheric Storage Tank Fires**.

By Niall Ramsden

The Project was initiated due to the oil and petrochemical industries' recognition that the fire hazards associated with such tanks, although known to be relatively low, were insufficiently understood to be able to develop fully justified site specific fire response and risk reduction policies. Open top floating roof tanks, introduced to reduce evaporative losses of product to atmosphere, had always been recognised within the industry as having a relatively good fire incident record when compared to other types of facility. However, the associated risk had not been sufficiently quantified. It was also recognised that when a major incident occurred, such as a full surface fire due to ignition when the floating roof had sunk, control measures, mechanisms for incident escalation and consequential potential damage to life safety, the environment, business interruption and asset value were largely misunderstood.

When such major incidents, albeit infrequent, occur, media interest is high and consequently there is considerable pressure on tank operators to demonstrate that they are taking all reasonable measures to minimise risk. In many cases there has been insufficient data to determine whether some risk reduction measures were truly effective or justified. Often the only information available was from organisations with a strong commercial interest in promoting one particular product or service.

It had thus been difficult for operators and legislative or statutory authorities to base risk reduction requirements on credible scenarios or proven effectiveness of mitigation measures.

When this situation was coupled with a general international recognition that prescriptive standards for fire protection were not always appropriate, it can be realised that there was a need to investigate, in depth, the fire risk associated with such facilities and develop a methodology by which a cost-effective, relevant and appropriate site-specific risk reduction policy could be determined.

Project Objectives

The LASTFIRE Project objectives were stated as:

- To determine the current levels of risks associated with fires in large (greater than 40m diameter) open top floating roof storage tanks.
- To establish recommended design and operation practice and to make this knowledge available throughout the industry.
- To provide techniques to enable individual operators to determine their level of fire related risk and identify appropriate and cost effective risk reduction measures.
- To identify the areas where a poor understanding contributes to the risk and, if necessary, to propose further work to overcome this.

Project Methodology

A true Fire Hazard Management (FHM) approach to reducing fire associated risk to as low as is reasonably practicable was adopted during the project. This was in line with international regulatory trends towards preparation of "Safety Cases" whereby all

date Project:

Tank Fire Hazard Management

aspects of risk mitigation including incident prevention are reviewed.

Previously, fire hazard management has tended to be very prescriptive and concentrated on fire fighting measures rather than incident prevention. As risk is defined as the product of incident probability and incident consequence, it is as important to reduce incident frequency as it is to minimise or mitigate potential incident consequences.

The Fire Hazard Management approach recognises that many factors can contribute to reducing risk. All such factors were investigated during the LASTFIRE project. The methodology adopted was scenario based.

From studies of incident histories and industry experience, the credible types of incident scenario were identified along with potential escalation consequences to life safety, the environment, business interruption, asset value or other issues such as public image or insurance costs. Next, all types of risk reduction measures were investigated and an assessment made of their contribution to risk reduction. The measures investigated included tank design features, operating practices, incident prevention measures, detection systems, fire protection systems and fire fighting techniques. In order to develop a site-specific Fire Hazard Management policy, it is also necessary to quantify incident probability and the cost of risk reduction measures. From this, an assessment can be made of the benefit provided by each risk reduction measure. The LASTFIRE project, therefore, not only investigated the contribution to risk reduction of each potential measure but also its cost so that a site operator could determine which measures were appropriate and beneficial for their particular situation.

Project Approach

The sponsoring oil companies directed the work, each company having an equal vote on the Project Steering Group. The Steering Group appointed an independent Project Co-ordinator. This was Resource Protection International, an independent consultancy specialising in Fire and Explosion Hazard Management of oil and petrochemical facilities.

The Project deliverables were:

Incident Frequency Survey Report

This document reported the finding of a survey of the facilities owned and operated, worldwide, by the Steering Group companies, to establish the number of fire incidents within a large population of tanks thus allowing operators to understand current risk levels. This survey enabled the determination of:

- Dominant ignition mechanisms.
- Frequencies of initial fire events.
- Effectiveness of detection and protection systems and firefighting techniques.
- Estimates of asset loss and incident response.

Review of Escalation Mechanisms

This review provided details of the causes of initial fire events, the mechanisms by which such fires can escalate, factors that affect escalation and the current ability to detect imminent escalation or to predict consequences.

Descriptions of the current understanding of these escalation mechanisms were provided, together with how escalation was affected by tank design, construction, layout, contents and damage mitigation measures.

Risk Reduction Options Review

This document reported the findings of a review to assess the effectiveness, efficiency and practicability of fire risk reduction measures for large open top floating roof storage tanks. The information in the report can be used as an input to a site specific exercise in accordance with the methodology described in the Risk Workbook to evaluate the cost benefit of implementing risk reduction measures at any point during the design and operation of a storage tank.

The risk reduction options discussed included both incident prevention and damage mitigation measures. All options discussed have been actually implemented or proposed for use on open top floating roof tanks at some stage.

The information provided in the document, which includes general design, installation and maintenance considerations for each option, was based on discussions and brainstorming meetings held at various locations internationally involving relevant specialist groups.

Firefighting Foam Review

As foam is currently considered to be the most effective firefighting agent for fighting large tank fires, a thorough review of the current state of knowledge and experience of foams was carried out and reported as part of the project.

Risk Workbook

As part of the Fire Hazard Management philosophy adopted by the LASTFIRE project, a methodology was developed enabling a site-specific quantification and comparison to be made of the potential statistical reduction in fire risk that can be achieved with different risk reduction options.

The methodology was based on a cost benefit analysis framework that involves an assessment of a site's existing level of risk and the potential levels of risk reduction that can be achieved by implementing particular risk reduction measures. The methodology, described in the Risk Workbook, utilises the information reported in other LASTFIRE documents.

It was intended that this document provided a tool to help identify the most appropriate and cost effective risk mitigation options, which in itself should be one component of a co-ordinated Fire Hazard Management process. Thus, the Risk Workbook is essentially the main core document of the project into which all other documents have an input.

One of the major conclusions of the project was that policies for Fire Hazard Management of large, open-top floating roof storage tanks should be based on a site-specific risk analysis incorporating

cost-benefit analysis of potential risk reduction options. It is considered that, with good, pre-planned incident management, fires in such facilities should not represent a major risk to life safety or the environment and therefore further risk reduction measures should be based on their cost effectiveness. The Risk Workbook describes and gives examples of the methodology by which this cost-benefit analysis can be carried out.

Main Project Conclusions

The LASTFIRE project, from a comprehensive and independent review of the risks associated with large, open-top floating roof tanks and associated risk reduction options, provided a methodology by which operators can select appropriate and justified measures to reduce fire related risk to as low as is reasonably practicable for such facilities.

In order to achieve a full understanding of the current state of knowledge and the methods by which risk reduction can be achieved, it is important to view all the project deliverables and recognise them as complementary documents.

However, some of the main conclusions and results are:

- Storage tank fires of the type under review should not represent a major risk to life safety or the environment provided the fire response is well managed to a pre-planned strategy.
- Prescriptive requirements for provision of risk reduction options cannot be universally appropriate because each specific facility operates under different conditions.
- The best practice regarding risk reduction in general and fire response specifically is to use a Fire Hazard Management approach throughout the life cycle of the facility. This will result in a site-specific policy based on cost benefit analysis of risk reduction options.
- The statistical analysis within the Steering Group members has shown that the fire incident probability and associated risk is relatively low.
- Rimseal fires are the most likely fire scenario in open-top floating roof storage tanks. In well maintained tanks it is unlikely that rimseal fires will escalate to full surface fires. (Only one of the 55 rimseal events recorded in the original Incident Survey escalated to a full surface fire.)
- Lightning is the most common source of ignition.
- Correlations between rimseal fire frequency and thunderstorm frequency have been developed from the statistical analysis.

  Typical sample rimseal fire frequency for Northern Europe was found to be 1 x 10^{-3}/tank-year.
- The generic event frequencies for fires other than rimseal fires are as given in the following table:

Type of Fire	Base Frequency (x 10^{-5})/tank-year
Spill on roof fire	3
Small bund fire (mixers, pipes, valves or flanges)	9
Large bund fire (major spillage)	6
Full surface fire following sunken roof	3

- A fire risk related tank inspection programme (and corrective action being taken on identification of a potential problem) is one of the most effective risk reduction measures.
- The detail design of fire detection and protection systems is often inadequate due to the lack of operational experience and understanding within engineering design houses. Input should be sought from site-experienced fire professionals.
- It is important to develop incident response strategies prior to an incident along with preplanning documentation, regular exercises and appropriate training for all responders.
- It is clearly concluded that Fire Hazard Management policies should be developed from a site specific analysis, but guidance is provided in the project deliverables on those measures which are most likely to be justified from the analysis.

In addition to the above studies, a special protocol was developed by the Group to test the fire fighting foams for the special circumstances of a tank fire. Previously all recognised tests had been aimed at simulating the conditions of a rapid rescue type situation such as aircraft crash fires – a situation demanding completely different foam characteristics from a tank fire. The protocol has now been adopted by several companies as part of their rigorous foam specification and procurement process.

A training video on how to tackle rimseal fires was also produced. It was produced by firefighters for firefighting and gives practical advice on different strategies that can be adapted according to local conditions and resources at the time of the incident.

THE UPDATE PROJECT

In 2003, some of the major oil companies who had been members of the original study requested that Resource Protection International update all the work that had been done and extend it to cover other types of atmospheric storage tank – fixed roof and internal floating roof. This request was in recognition that significant developments had occurred in tank construction, incident detection and fire fighting strategies. In addition, of course, there had been new incidents from which additional lessons could be learned.

The LASTFIRE Update Project has now been going on for 4 years and it is the intention this time that it will continue in its role as the major industry forum related to storage tank fires.

LASTFIRE STUDY MEMBERSHIP

Any company operating atmospheric storage tanks can join. Member companies can benefit from:

- Membership of and influence within an internationally recognised industry body specifically related to Storage Tank Fires
- Networking with fellow professionals
- Immediate access to latest incident databases, risk reduction practices and research work
- Benchmarking with other relevant organisations

The current members are:

ADCO	MOL
BHP BILLITON	NESTE OIL
BOTAS	PETRONAS
BP	REPSOL
CEPSA	SAUDI ARAMCO
ENI	SHELL
IDEMITSU	TAKREER
MERO	TOTAL

What are Group Member commitments?

- To provide data on their storage tank incidents. This information is provided to the Project Coordinator, Resource Protection International, who adds it to the database on a confidential, anonymous, basis.
- To provide experience based input to the RRO.
- To share any incident experience or other issues related to storage tank fires with the Group. All information presented within "closed" sessions is kept confidential within the Group.
- To host meetings in rotation.
- To encourage other companies to join the Group.

What happens at a LASTFIRE meeting?

LASTFIRE meetings occur twice a year at international locations. They are usually split into two sessions – the first a "closed" meeting for members only, the second being open to invited guests to give technical presentations on any issues directly relevant to storage tank Fire Hazard Management.

Examples of recent presentations include:

- Commissioning of Major Incident Response Units at various tank farm and industrial complexes.
- Incident response experiences.
- Environmental aspects of foam application.
- New standards in foam application.
- Developments in incident detection systems.
- Geodesic domes and affect on Fire Hazard Management.

All presentations are loaded on to the LASTFIRE website which is accessible to LASTFIRE members through a password system.

What is the fee for LASTFIRE?

A sliding scale of fees is applicable according to number of member companies. However, the Group has voted to maintain the fee at a standard amount in order to fund theoretical or experimental work such as the boilover work. Current projects for further work being considered are:

- Additional boilover work
- Development of a LASTFIRE Tank Workshop including both theoretical and practical sessions
- Measurement of vapour emissions at internal floating roof tanks under different operating conditions
- Experimental work with alternative extinguishing methods for internal floating roof tanks

The majority of the current annual fees are allocated to funding the research work. IFP

How do you join?

Any company wishing to join the study should contact the Project Coordinator, Resource Protection International, for further information and contract details:

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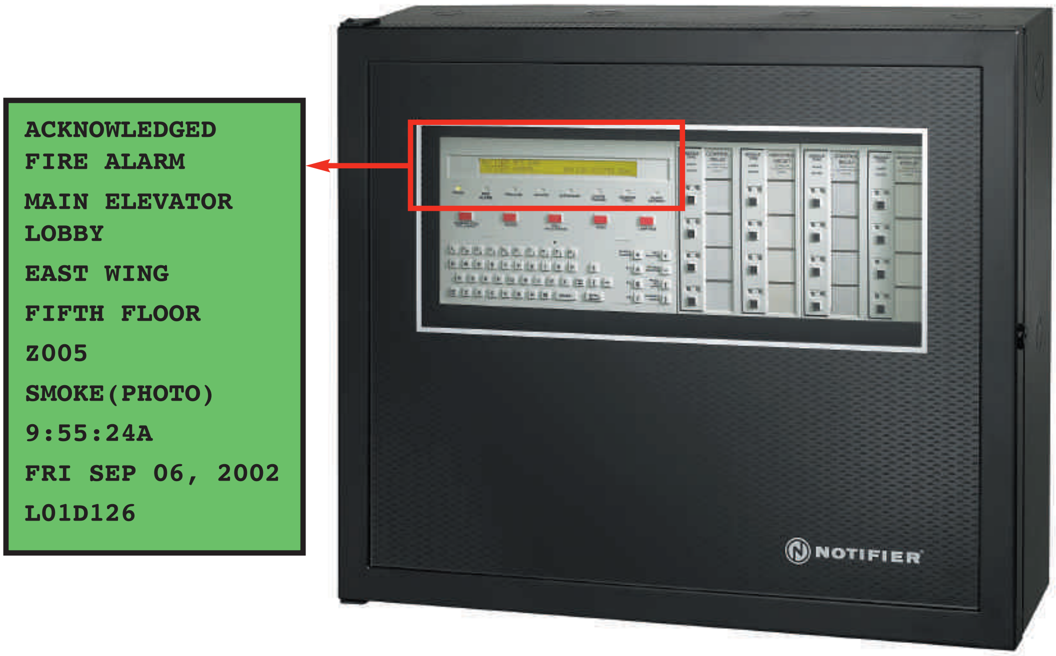
Resource Protection International
Walker House
George Street
Aylesbury
Bucks HP20 2HU
Tel: 01296 399311
Email:
ramsden@resprotint.co.uk
Website:
www.resprotint.co.uk

Figure 1



Evolution of Fire Alarm Technology:

Interactive Firefighter's Display

Envision a fire department responding to a fire alarm in the middle of the night. The facility is primarily occupied during the day, like an office building, shopping mall or industrial plant. There is no visible smoke. This building – like many others around the world – has no trained security force patrolling it, no bank of CCTV monitors being carefully watched for any sign of trouble.

By P. Ebersold

Honeywell Notifier

When an alarm from the fire control panel alerts the local fire department to a potential fire situation. This happens everyday to firefighters around the world. When the firefighters arrive and enter the building, they have many crucial questions:

- Where is the emergency?
- Is it an actual fire event and if so, where did it start?
- How long has it been burning and which way is it spreading?
- What's the fastest way to reach people in need of aid?
- Are there any internal structural or chemical hazards?

Revolutionary Firefighter Tool

When firefighters arrive on the scene of a building fire emergency, they first must gather information to accurately assess the situation. Speed of assessment is critical. The more rapidly the origin of the fire and its progression is identified, the more effectively resources can be deployed on the fire scene. Increased speed and accuracy of response result in the potential reduction in loss of property and life.

Using a new interactive wayfinding technology, firefighters receive answers to critical questions quickly and reliably. This revolutionary touch-screen PC for firefighters simplifies emergency scene assessment by pinpointing the origin and migration of a fire. The display is installed in a building lobby or main entrance to a facility. This breakthrough technology gives first responders the ability to access the information they need to perform their jobs safely, effectively and efficiently. Firefighters now have an additional tool to fight a fire, potentially reducing property loss and

improving life safety for building occupants and the firefighters themselves.

The new interactive firefighter's display is housed in a rugged wall mounted box to be installed in a building's lobby or common area. The display is powered by a 24 volt power supply with battery backup. The box is locked during normal conditions and unlocks automatically once the fire alarm system is activated. The touch screen is driven by the fire alarm system. Multiple displays can be installed in any facility. For example, in sprawling industrial complexes, a touch screen display can be positioned at every major facility entrance. The display units operate separately, so unique information can be viewed on different units simultaneously.

Fire Alarm System Evolution

Fire alarm life safety systems have been moving towards more intelligence for quite some time. The dramatic shift in demand from conventional to addressable systems was driven by the need to more accurately identify the origin of a fire alarm. Addressable systems have the ability to pinpoint the origin of an alarm, whether it is an automated fire detection device such as a smoke or heat detector or a manually operated device such as a pull station. Modern addressable fire systems not only have the ability to display a description of the location but also the ability to crudely communicate the spread of the fire. The new interactive firefighters display is the next evolutionary step in intelligent fire systems.

Addressable fire alarm control panels (FACPs) were one of the first steps to assist in pinpointing the origin of a fire. With features such as custom labels, the FACP can display an alphanumeric description of the location of an activated detector(s). This custom label information is most useful to someone who is familiar with the layout of a building such as a facility manager or maintenance personnel. Since many life safety emergencies can occur after normal working hours, building personnel may not always be on site to assist firefighters in locating a fire. The new wayfinding technology gives firefighters timely information on the origin and spread of a fire within a structure whose layout they are not likely to be familiar with.

Today, current fire alarm control panels (FACPs) and annunciation technologies in commercial buildings are a primary source of alarm information for firefighters arriving on the scene. This is particularly true at night when building occupants are not there to report their observations. Current fire alarm control panels and traditional annunciators indicate only the devices that are in alarm (see Figure 1). This sensor/detector information is given in a rather austere form. Typically, the fire panels presents activated smoke/heat detectors as items in an alphanumeric list, each activated detector described by an alphanumeric location code, and an activation time.

In order to interpret the data the firefighter must perform two tasks. First, they must translate the alphanumeric location code for each detector in the series to a location in the building. Second, in order to understand the time sequence in which the detectors were activated and hence, assess the speed of fire propagation, they must read through the times in the alphanumeric detector list and create a mental timeline. To understand both the speed and direction of fire propagation, the firefighter must do both of these simultaneously. In contrast, the firefighter display saves crucial assessment time by providing a spatial, graphical depiction of the location of activated detectors in the building and a graphical visualization of the time sequence of detector activations.

But with this new wayfinding technology, firefighters are no longer limited to fire alarm information only. Now they have the power to see


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Figure 2

Facility Type	Why Use Wayfinding Technology?	Examples
Medium to Larger Size Buildings & Complexes	Fighting fires in larger facilities tends to be more complicated with involved building layouts.	• large distribution centers • assembly plants
High Value Buildings	Buildings occupied by a large number of people or contain extremely valuable property need fire response personnel immediately directed to the event location.	• hospitals • museums and galleries • high rise office or residential properties • sports arenas • concert halls
High Risk Buildings	When buildings have high risk and/or hazardous materials, wayfinding technology clearly shows the location of these materials on the building layout. By selecting the HazMat icon, the first responder can learn important details about the material and appropriate fire suppression technique.	• petrochemical plants • munitions manufacturing • data storage • archival storage facilities • laboratory facilities (commercial, education, forensic)
High Visibility	Businesses that can gain increased security by including wayfinding technology in the fire and life safety system.	• luxury hospitality • high rise condominiums • shopping malls • premium office space

virtually everything within the building that can help or hinder their response. In addition to these two major features, the display also support firefighter situation assessment by providing easy access to graphical, spatial information on the location of water supplies, evacuation routes, access routes and points, fire barriers, gas, power, and HVAC shutoffs, and chemical and structural hazards present in the building.

Designed by Firefighters, For Firefighters

When a firefighter arrives on the scene, the time required for scene size-up must be minimized while the amount of information gathered must be maximized. As a result of thorough research and extensive interviews with senior level professional firefighters, the new interactive display was developed to provide critical answers in 30-60 seconds. The display is so intuitive to use that no special training is required. Firefighters can quickly obtain crucial information about a building emergency that is easy to interpret with a spatial, graphical depiction of the location and sequence of detector activation.

When a firefighter first approaches the display, the default screen graphically identifies where active detectors are located in a structure overlaid on the building floor plan. The active detector icons flash in sequence of activation to clearly indicate fire origin and the direction which it is spreading. By selecting the active detector icon, the firefighter learns the device details and how long it has been active. On the first screen the responder has an overview of the entire building, viewing crucial data such as the number and location of all entrances and exits, offices/rooms and wall locations. Any hazardous materials in the facility are also immediately apparent with HazMat icons overlaid on the floor plan.

Firefighters have a choice of which information to access, based on what type of emergency is occurring and what their experience tells them they need to know quickly. The large display and clearly labeled icons makes it easy for fire fighters to touch the screen and gather critical event information even while wearing thick gloves. Each screen gives maximum information with minimal navigation. In fact the user is never more than one screen away from the information they need.

And finally, all the icons used are industry standard and instantly recognizable to virtually all first response personnel. If the building is part of a new development, or if the first responder is not completely familiar with the area in which the building is located, he or she can access a site plan that shows the building's geographical location and position in relation to surrounding streets, landmarks, or other buildings. And first responders no longer need to search for emergency contact names or other important phone numbers. All this information is displayed on the contact list, which is clearly marked on the interactive touch-screen.

Applications/Typical Installations

Because the interactive display is designed to speed up and clarify the decision making process for firefighters, the more complex the decision making process, the more valuable the system. Therefore, the system is most important to larger buildings and larger complexes/campuses.

One of the first installations of this new technology is in a science building of a university in the United States. The complex layout of the laboratory facility and the numerous hazardous materials used and stored in the laboratories make the interactive display valuable. Some other key applications are outlined in Figure 2.

Conclusion

The new firefighter's interactive display takes the information available to responding fire companies to the next level and increases the value of the fire alarm system in planning an attack on a fire. Ultimately, this new wayfinding technology assists firefighters in what they do best: evacuate the building, locate the seat of the fire and extinguish it to stop further property loss. IFP

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Fire Pump Controllers:

The new EN Standard for Europe?

A large building or factory requires some kind of fire protection, usually in the form of sprinklers. In most cases, the public water supply cannot provide enough volume and/or pressure to directly drive the fire sprinklers so a fire pump installation is required.

By David Carter

Managing Director of Metron Eledyne LTD

A typical fire pump installation includes several components:

- A pump that is specified to the correct water pressure and flow
- A pump driver, either an electric motor or a diesel engine
- A fire pump controller for automatic operation of the pump driver
- A gear drive for transmitting power from the pump driver to the pump itself
- A water relief valve to relieve or limit excess pressure in the event of diesel overspeed
- A water supply, either from a natural or man-made pond or from a water tank.

There are many different fire pump installation rules and regulations through out the world. The nearest thing we have to a world standard is the NFPA 20 (National Fire Protection Association pamphlet 20). NFPA 20 originates from the USA.

Standardization in Europe?

In September 2007 a European Norm standard EN12845 will come into force. This is a fire sprinkler specification which includes a definition for the fire pump controller. In the UK, LPC have already started to adopt the standard and it will be mandatory by September.

Most other EU Countries have to yet to fully embrace the new standard. Only time will tell how successful this standard is in terms of harmonizing the fire sprinkler code through out Europe.

Multiple Pump Arrangements

If a site requires more than one pump to meet the demand, then all pumps must have a similar curve in terms of flow and pressure. If two pumps are needed then each pump shall independently be capable of meeting the required flow and pressure for the site. If three pumps are deemed necessary then only one is permitted to be an electric motor driven pump. All pumps shall be shutdown only by manual means.

Electric Motor Controllers

The most important aspect of an electric motor controller is the electric supply, this according to the specification 'must be available' at all times. The electric motor controller must have its own dedicated circuit breaker in the sites power distribution board, and marked accordingly. The main danger of failure on an electric set is the possibility of loosing the mains supply, and as such the cabling from the power distribution board must be protected from damage and fire. The routing of the power cables is critical and in some cases run outside the building being protected in single lengths with no joins, or run though an area of minimum fire risk.

Electric Motor Controllers, Starting Methods

To correctly specify an electric motor fire pump controller you must of course know the motor kW or HP rating along with the supply voltage. The starting method must then be chosen. The following methods have been traditionally used in Europe:

- Direct on line or across the line, up to 100kW
- Star delta or wye delta reduced starting method for over 100kW

Electronic soft starters are now becoming an alternative accepted method of starting the motor where the incoming supply has limited capacity, but the controller must also have the facility to perform an emergency start.

In the fire pump controller itself must be a fused isolator, with fuses that will carry the motor starting current for greater than 20 seconds. This is a major difference from the NFPA #20 standard because this requires a circuit breaker to be the main protection device.

Also on the controller must be an ammeter to show the motor running current and a manual start push button. The motor can be also started by an external pressure switch but stopped only manually via the controller mounted stop push button. The controller must also provide visual indication of:

Power available
Pump on demand
Pump failed to start
Pump running

Diesel Controllers

On a diesel controller, the logic must be totally powered by the two engine starter batteries. The incoming mains supply is only for charging the batteries and therefore is not as critical a part as with electric motor controllers.

The diesel engine can be started either by an external pressure switch which will initiate the special automatic cranking sequence or by a controller mounted manual start push button. Either way, the engine can only be stopped manually. The automatic crank sequence is six attempts, with each attempt being between 5 and 10s with a dwell period of 10s between each. Each battery is cranked in turn. After each automatic start, the engine must be started manually again for testing purposes. While the engine is running, it is monitored for oil pressure and water temperature for alarm purposes only since the engine is expected to run to destruction. The following visual indicators are typical on an EN12845 diesel controller:

Battery 1 Healthy
Battery 2 Healthy
Engine running
Low oil pressure
High Water temperature
Low fuel level
Engine failed to start
Operate test start

Both the diesel and electric motor controllers must be remotely monitored by responsible personnel at a permanently manned sited.

Jockey Pumps

The above mentioned diesel engine or electric motor controller will automatically start the pump once it detects a drop in water pressure. Usually a jockey pump is included on an installation in order to maintain a steady water in the system. There are limited specifications for the jockey pump controller and these are often very simple direct on line low kW rated units with a minimum run timer.

Future Trends

Due to diesel engine developments, and also as a result of rapid developments in information technology, the whole field of fire pump control is likely to change dramatically over the next few years. Already we are seeing the change to electronically controlled diesel engines. This has come about due to the various world standards limiting emissions from diesel engines, but brings with it benefits in terms of higher levels of information from the engine systems. This when integrated with the advances in the controller systems will enable far more capability for remote monitoring and management of the fire pump system. International Companies with operating bases spread throughout the world, will be able to monitor both the operating characteristics and service requirements of their fire protection equipment from anywhere in the world via the internet, and receive fault notification by means of e-mail or text message to their service personnel. Engine and Controller manufacturers will be able to undertake remote fault analysis from their factories, and guide on site maintenance staff to a correct repair solution should a fault occur, without the need to send specialised service engineers to far flung corners of the world. IFP

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Gas Refinery Fire Protection

The threat of fire in the Oil & Gas industry is present during all phases and stages of exploration, production, refining, storage, transportation and dispensing to the consumer. Whether it is a raw product (crude), a product-in-process or final product, the threat of fire is always present and despite all prevention and protection measures and features, in addition to improved design features, construction materials and production processes, fire events still occur and can result in loss of life and property.

By Sameh Dawoud

RJA Group Inc.

A gas refinery (or a natural gas processing plant) is a facility designed to clean raw natural gas by separating impurities and various non-methane hydrocarbons and fluids to produce what is known as "pipeline quality" dry natural gas (mainly methane). A gas refinery is also used to recover natural gas liquids (NGL) which are valuable by-products (including ethane, propane, iso-butane and natural gasoline). These NGLs are sold separately and have variety of different uses; including enhancing oil recovery in oil wells, providing raw materials for oil refineries/ petrochemical plants and as source of energy.

Pic courtesy of Statoil – www.statoil.com

Type of Raw Natural Gas Wells

Raw natural gas comes primarily from any one of three types of wells:

- *Crude oil wells:* The natural gas that comes from this type of wells is termed "associated gas" as this gas can exist separate from the crude oil in the underground formation or dissolved in the crude oil.
- *Gas wells:* Gas from these wells is termed "non-associated gas" as there is very little or no crude oil.
- *Condensate wells:* Gas from these wells is termed "non-associated gas" as these wells produce raw natural gas along with a very low density liquid hydrocarbon called "*natural gas condensate*" (sometimes also called *natural gasoline or condensate*".

From the wellhead, natural gas is transported to the processing plants by tankers or through a network of small-diameter, low-pressure gathering pipelines.

Gas Refinery Processes

Processing natural gas to pipeline dry gas quality levels can be quite complex, but usually involves four main processes to remove the various impurities:

- Oil and Condensate Removal.
- Water Removal.
- Separation of Natural Gas Liquids.
- Sulfur and Carbon Dioxide Removal.

The release of flammable gases can lead to different kinds of fires depending on the gas released, the mechanism of release, the gas temperature and pressure, ambient conditions and the point of ignition.

Pic courtesy of Statoil – www.statoil.com

After processing, the pipeline quality natural gas is injected into gas transmission pipelines and transported to the end user. This often involves transportation of gas over hundreds of miles, as the location of gas production is generally not the location where the gas is used.

Fire Hazards in Gas Refineries

Most threats to Gas Refineries result from accidental release of gases, which when mixed with air, form ignitable mixture within the flammable limits. With the introduction of ignition source a fire can start. Ignition sources can be electrical (e.g. wiring or motors), open flames, cutting and welding, smoking, hot surfaces, mechanical/static sparks, transient ignition source and lightning.

The safety of gas refineries from fires starts with the initial stages of the facilities' design and continues for the life of these facilities. As technology advances, so should the measures to protect these facilities and that includes analysis techniques/methodology/tools and more use of computer fire modeling.

The release of flammable gases can lead to different kinds of fires depending on the gas released, the mechanism of release, the gas temperature and pressure, ambient conditions and the point of ignition.

Jet fires are the most common type of fires in gas refineries/processing plants.

Safety Measures/Features

FIRE PREVENTION: As a general rule in the fire safety concept, the best defense against fire is to prevent fires from starting in the first place. Such objective can be achieved through:

- Proper design of the gas refinery, utilizing proper construction materials, equipment and utilizing the proper processes that eliminate the probability of accidental gas release. Every process component is protected with 2 levels of protection: primary and secondary where the secondary level functions should the first level fails to function properly.
- Strict enforcement of: (1) Procedures for administrative control of transient combustible materials, ignition sources and hot work and (2) Housekeeping program.
- Proper employees training to eliminate/minimize the potential for human errors.
- Properly performing periodic maintenance of the facility.

FIRE PROTECTION: Due to the rapid nature of developing fires in gas refineries, fast detection of gas leakage plays a major role in the refinery's capability to control/extinguish fires.

- *Detection Systems:* Gas detectors/sensors are located where there is a probability that gas will accumulate when a leak occurs. When the gas to be detected is lighter-than-air these sensors are installed above the gas-containing equipment and are placed to take advantage of normally occurring air currents and the difference in the density of air and the flammable gas in question.
- *Fire Suppression:* The most effective way to control/extinguish fires in gas refineries/processing plants is to shutoff/stop the flow of gas to the fire. Such measure can be achieved through proper design, selection, location and installation of emergency isolation/shutoff valves. Gas fires can be extinguished by conventional extinguishing agents, including carbon dioxide and dry chemicals. Water based systems are used to cool off adjacent areas and should not be pointed towards the point of gas release/leakage.

FIRE MITIGATION: These measures are intended to mitigate effects of potential fires and include the responding fire brigade (proper qualification/training of fire fighters and using the proper equipment to combat fire with the proper periodic maintenance being performed on these equipment).

Conclusion

With the increasing demand of Liquefied Natural Gas (LNG) as a fuel alternative, the safety of gas refineries/processing facilities becomes increasingly important. The safety of gas refineries from fires starts with the initial stages of the facilities' design and continues for the life of these facilities. As technology advances, so should the measures to protect these facilities and that includes analysis techniques/methodology/tools and more use of computer fire modeling. IFP

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Detection equipment standards:

from prescription to accreditation

By Keith Minster

Sales manager UK & Ireland, Morley-IAS by Honeywell

Introduced back in October 2006, the Regulatory Reform (Fire Safety) Order (RRFSO) was designed to address a number of shortcomings in earlier regulations relating to fire protection.

Previous fire safety legislation, for example was fragmented, inconsistent and in many cases difficult to understand. By contrast, in replacing two major overlapping pieces of legislation in particular – the Fire Precautions Act 1971 and Fire Precautions Act (Workplace) Regulations 1997 – as well as amending or superceding a further 118 fragmented pieces of legislation, the RRFSO provides one simple, integrated regime of fire safety legislation for all commercial buildings.

At the same time, the RRFSO reflects two further critical shifts of emphasis in maintaining a consistent high level of protection of people and property. First, by adopting a risk assessment approach to fire safety it recognised that the strongly prescriptive nature of the earlier regulatory regime was stifling innovation.

Second, in moving away from a restrictive certification approach, there has been a shift in responsibility for ensuring that buildings meet the necessary compliance criteria under the new regulations. The RRFSO introduced the concept of the 'responsible person' – typically the employer, site manager or the owner of the building – who has a duty to undertake a full risk assessment and maintain fire precautions, in order to comply with the regulations.

This has a number of consequences. The nominated 'responsible person' is unlikely to be a fire safety expert and so will have to engage suitable specialists and take appropriate advice, in order to take the necessary preventative steps to ensure compliance with both EU and local regulation. And increasingly, in line with a broader shift in fire safety legislation, manufacturers and their products, together with specifiers, installers and maintainers, will have to be third party accredited in order for the responsible person to be able to show that they have taken the appropriate action.

For its part, freed from the time-consuming

responsibility for visiting each new site to issue fire safety certificates, the local fire authority can now concentrate its efforts on prevention – through education and the promotion of fire safety – in addition to enforcing the new legislation.

So what are the key areas of national and Europe-wide legislation which now impact on fire safety and what demands do they put on those involved in the full end-to-end provision of detection and alarm equipment?

BS 5839-1

First introduced in the UK more than 50 years ago, BS 5839-1 is the Code of Practice for system design, manufacture, installation, commissioning and maintenance and over time has developed to keep pace with contemporary custom, practice and technology and reflects how today's fire alarm contracts work.

In line with other legislation, the most recent update in 2002 is once again less prescriptive and more 'user-friendly' in its application. Similarly, it adopts a risk assessment approach in defining the level of protection required in each case and incorporates definitions for each of the roles within the process, including the responsible person, designer, installer and user.

BS 5839-1 identifies three categories of fire alarm system – Category M for Manual only, Category L for Protection of Life and Category P for Protection of Property – and within these, addresses specific areas such as corridors and stairways and high risk areas within the building. Many buildings will require a combined system: in the case of a warehouse for example, the main storage facility will require property protection, with a manual or life protection system for the adjoining office area.

Having defined the relevant category, BS 5839-1 then provides a set of standardised best-practice guidelines for each level and type of risk. This may include, for example, the spacing between detectors, sound output for sounders and where manual call points should be mounted, as well as detailed information as to how the detection and alarm system should be put together, how to minimise false alarms and appropriate evacuation strategies.

BS 5839-1 incorporates the latest fire protection technologies, including multi-sensor, carbon monoxide and video detection and its less prescriptive approach is typified by the acceptance of 'variation' in applying the rules rather than avoidance of 'deviation'.

EN54

As the national installation standard in the UK, BS 5839-1 requires that all components comply with the relevant European standard. In this case, EN54 covers all aspects of fire protection equipment – including control and indication equipment, or c.i.e. (Part 2), audible fire alarm devices (Part 3), power supply equipment (Part 4) and visual alarm devices (Part 23).

EN54 is highly adaptable, as it was developed to meet diverse approaches to fire protection systems across Europe. And, as part of this more flexible approach, EN54 is still evolving to define new devices.

Individual standards are currently undergoing harmonisation across the EU and, once completed, every member state will work to these common rules and local rules will become obsolete. In particular, the control equipment standard (Part 2) is due to be harmonised across Europe in January 2008. However, it is already in place in the UK and major manufacturers' equipment is typically built to meet EN54 standards.

The value of EN54 in providing a common set of standards for fire protection components is not restricted to Europe however. EN 54 has been adopted as the basis for the international standard by ISO (7240 Series) and is widely accepted by fire authorities across the globe, including Africa, the Middle and Far East and Russia.

Related European Directives

The overall purpose of such directives is to provide a common harmonised approach to fire safety for the EC and EFTA, by preventing fire hazards, electric shocks and reducing EMC pollution. At the same time, in stating the legal objectives which must be met, they are designed to enable free passage of goods between member states.

In short, the CE mark showing compliance with the applicable Directive acts as a technical passport for any product throughout the EC, without having to clear any further local approval hurdles.

As all aspects of fire safety equipment become harmonised under EN54, so they will become subject to the constraints of the Construction Products Directive (CPD). The scope of the Directive covers all products which form part of a new building and include components of fire detection and alarm systems and fixed fire suppression systems – but not products that are not fixed, such as portable fire extinguishers.

In the case of earlier regulations affecting fire safety equipment, such as the Low Voltage Directive (LVD), manufacturers have been able to achieve compliance through a process of self-certification, by undertaking a level of due diligence testing appropriate to their share of the market.

The CPD, by contrast, requires manufacturers to go a step further, by having their products independently certified to EN54 and ISO9000 by a Notified Body (such the LPCB in the UK). A transition period is allowed for this to take place, but at the present time the UK, Ireland and Sweden have opted out, as they have a large number of smaller manufacturers facing the high cost of achieving third party approval.

Yet at the same time, the Fire Industries Association (FIA) in the UK strongly recommends certification and VdS, the national approvals agency in Germany, has imposed especially stringent local certification requirements.

It seems likely that that those countries opting out at the present time will come into line in the foreseeable future. And companies like Honeywell – supplying its Notifier and Morley-IAS products to the international market – have already ensured their products meet the tougher demands of the German market in order to ensure total acceptance throughout Europe.

Spirit of the law

In the case of the RoHS Directive, aimed at removing hazardous substances from electrical products and components, strictly speaking the regulation would not appear to apply to fire alarm systems as they are fixed installations. Yet in complying with the spirit of the regulation, major manufacturers are moving toward RoHS compliance by eliminating lead from all components.

Similarly in the case of the WEEE Directive, which seeks to regulate the responsible recycling and disposal of electrical and electronic products at the end of their useful life, it is still unclear as to how the regulation will operate with regard to fire safety equipment.

However, in marking products appropriately as required by the Directive, once again work is underway at an individual company and trade body level to ensure that, throughout the supply chain companies meet their broader environmental obligations throughout the life of their products and beyond.

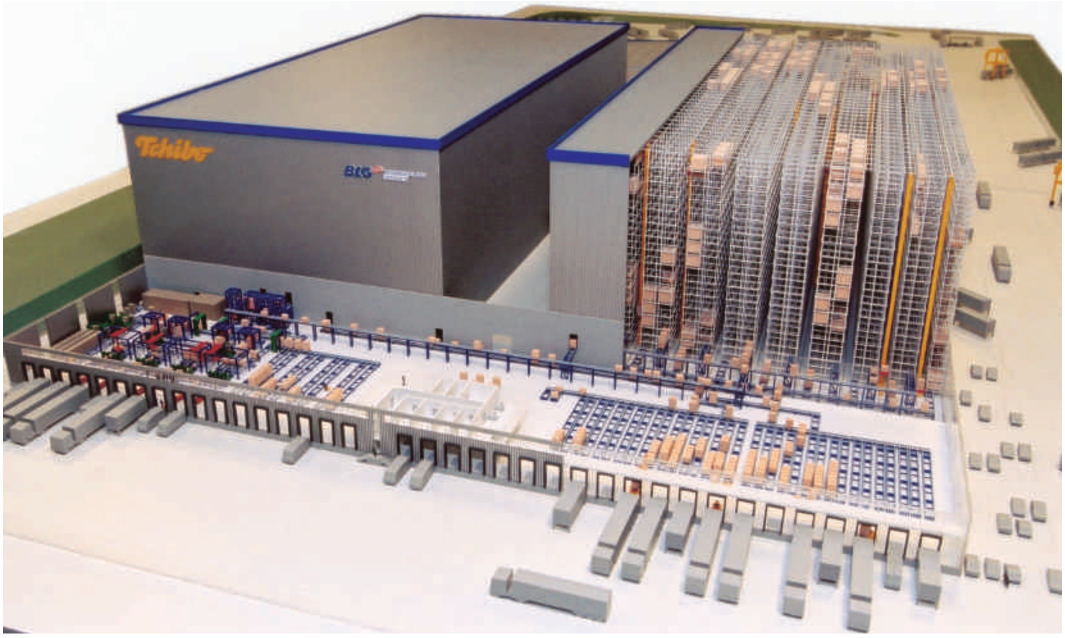
Finally, the industry is currently undergoing a transition period with regard to the Electromagnetic Compatibility (EMC) Directive, which is due to come into force on 20 July 2009. The Directive, which encompasses all fixed installations, requires the responsible person to ensure the compatibility of the complete fire alarm system with other on-site electrical equipment such as telephony and computer systems, rather than on a component-by-component basis.

This will require back-up technical documentation to support compliance including evidence that the installer has adopted best practice with regard to cabling, bonding techniques and the use of CE-marked equipment.

As elsewhere therefore, the non-specialist 'responsible person' must seek specialist advice to fulfil their obligations under the new regulations. Strong emphasis is now placed on the use of high quality products and services, as increasingly, end-users must be able to show they have used third-party accredited installers with independently-approved fire safety products.

Yet in taking expert advice from a fire safety provider, the rules generally are not onerous, nor do they typically involve the building operator in additional expense. The procedures to ensure compliance may have been tightened, but in many cases these relates to actions which the operator should already have been doing under earlier legislation.

In short, if the risk assessment is undertaken properly with the right people involved, the process of securing compliance should be automatic and straightforward. IFP



The Next Generation of Fire Protection Devices:

Smaller, Lighter and Easier to Install

By Larry Thau

Vice president Engineering, Victaulic

It would be fair to say that piping and plumbing companies are not reknowned for investing large amounts of their time and money in R&D. However Larry Thau, vice president engineering of Victaulic, world leaders in piping system solutions, shows how research and development has changed the face of piping systems. As a result, companies such as Victaulic are ensuring increased product installation speeds and performance throughout the fire protection industry.

R&D, the life blood of a company

Before entering the fire protection industry in 1996, Victaulic was well-known for its range of industry leading non-weld grooved end couplings and fittings for the HVAC and industrial sectors. With R&D at the core of the company's philosophy, a lot of thought was given to the difference that could be made to the fire protection sector before investment was made in this area. One of the first questions that the company asked itself before deciding to enter the fire protection sector was "can we offer something different?" On careful examination of the existing fire protection market the R&D team felt that Victaulic could play a role in developing products that would offer significant advances to the market.

Within mechanical joint pipe development, only a few manufacturers are actually involved in new product development, rather than the creation of "me-too" products. New product development in this field is about evolution, rather than revolution. Victaulic has built its business on creating innovative products and then evolving them over time. A case in point is the Victaulic world leading grooved end coupling – the fundamental basis of the joint hasn't changed since the company was created back in the 1920's. However, the company's 100

strong R&D team is committed to fine-tuning the system's efficient use of materials, increasing efficiency in manufacturing and enhancing product performance, all whilst making considerable gains in field productivity.

Evolution not revolution

Product evolution comes about at Victaulic as the R&D team is exposed as much as possible to the drivers for change in the company's business – its customers. One of the most successful tools to date for understanding customer needs is the company's regular customer counsels that R&D team members attend. A select group of customers is assembled from different markets at two-day events for the R&D team to learn as much as possible, both positive and negative, about Victaulic products and how they are used by customers.

The success of the customer counsels is in the application of the knowledge learned by the R&D product engineers. This knowledge can lead to R&D developments of merely fine-tuning a product or going back to the drawing board and creating an entire new product range. On entering the fire protection market, R&D team members spent a lot of time talking to industry experts to discover any problem areas they may have encountered during installation of any products. Apart from the difficulties of accessibility for some job sites and fitting a sprinkler system in at great heights, alternate valve installation was named as an area that needed improvement. For the last 50 years, the dry valve had remained largely unchanged, with the size, weight and technical installation requirements of the system making it a specialist fitting job.

As with most inventions, the seed of an idea can be immediate, but the breakthrough in the actual development of the product takes a little longer. How to change the dry valve's installation footprint and weight and make its fitting and maintenance as simple as possible were the challenges faced by the seven-strong specialised R&D team. The result of 10 years of research and development work is seen in the launch this year of the industry's easiest to fit, smallest installation footprint line of dry, alternate (wet/dry), wet, deluge and pre-action devices – Victaulic FireLock NXT'. Not only does the introduction of the FireLock NXT device offer faster installation times for alternate valves, it also enables them to be fitted in smaller areas. Plus, now contractors will not have to rely on using a dry-valve installation specialist to complete their fire protection systems.

From drawing board to product

From an engineering standpoint, the Victaulic R&D team had the opportunity to change the way the dry valve actually worked at the product design stage. Victaulic engineers focused on designing products that were smaller, lighter and easier to install and maintain, desirable qualities consistently voiced by installers in the field.

The first area the team addressed was to remove from the installation process the need to calculate the pressure differential. Engineers recommended providing an actuator in the valve trim to maintain consistent pressure requirements. If this could be achieved, then the device would require less specialisation to install. With existing valves, the installer had to determine the water pressure within the body of the system and then calculate the air pressure required to hold the

As with most inventions, the seed of an idea can be immediate, but the breakthrough in the actual development of the product takes a little longer. How to change the dry valve's installation footprint and weight and make its fitting and maintenance as simple as possible were the challenges faced by the seven-strong specialised R&D team.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water back. Calculations needed to be exact to ensure the system would meet industry requirements for the system to return to operating pressure after activation within 30 minutes or less. By integrating a Victaulic patented low-pressure actuator into FireLock NXT, the device operates at a common 0.89bar/13psi pressure, regardless of application, eliminating the air-to-water differential and ensuring faster water delivery to the sprinkler systems.

footprint of the valves mean that they typically arrive on-site in hundreds of pieces and need to be fitted together like a puzzle. This is still true today for the majority of valves. However, by using an innovative diaphragm, introducing a one-piece design for the air feed manifold, combining the check valve, strainer and restrictor, and reducing the size of the air compressor, the end result provides Victaulic FireLock NXT devices the smallest footprint in the industry. Speed of installation is

Apart from the air-to-water ratio during installation, another common issue with fire protection devices is their physical size. The weight and footprint of the valves mean that they typically arrive on-site in hundreds of pieces and need to be fitted together like a puzzle.

With the air pressure set at 13psi (and tripping at 6psi every time), the device size could also be reduced. With a standardized air pressure requirement, a smaller air compressor would provide sufficient pressure. In addition, by introducing a pre-set air supervisory switch to each valve, the installation process was simplified and accelerated.

Apart from the air-to-water ratio during installation, another common issue with fire protection devices is their physical size. The weight and also at the heart of the new design, and the valve (weighing as little as 43kg) can be ordered pre-trimmed and ready to mount on the riser with the need for only a pressure gauge connection upon arrival.

As with any new product development, there are developmental stages and modifications. The first generation of Victaulic devices were smaller, lighter and easier to install than competitive devices, but on-site maintenance issues still arose.

Working alongside customers, the R&D team addressed areas of weakness and engineered them out of later FireLock NXT devices.

To comply with industry regulations, water-based fire protection systems needed to be inspected and tested at regular intervals. Whether when inspecting the system or resetting the valve due to a false alarm or fire, the faceplate of the majority of devices on the market had to be removed to access the inner mechanism. The latest Victaulic device has been designed to ensure that the valve can be re-set without opening, so routine maintenance or testing can be done quickly and easily.

The FireLock NXT alternate valve takes wet and dry fire protection to the next level. Not only does it provide both wet and dry functionality in a single valve, but it also requires the adjustment of only three valves to drain and re-pressurize the system for warm or cold weather.

Taking fire protection to new levels

Ease of installation is a theme that runs throughout the Victaulic range of sprinklers, couplings, fittings and devices. The combination of speed and fitting ease has proved invaluable on many jobs, including the largest fire protection installation seen to date in mainland Europe. When working on Tchibo's state-of-the-art, Europe-wide logistics facility earlier in the year, BLG Logistics placed a priority on speed of installation and delivering the 47,500 m^2 multi-functional warehouse on budget. Following talks with Minimax, Germany's leading supplier of fire protection products and solutions, BLG Logistics chose the company to do the entire fire protection installation due to its experience with other large-span projects. With more than 9,000 pallets passing through the warehouse a day and a surface area equivalent to 22 football pitches, the Bremen high-bay warehouse has been designed with ultimate functionality in mind.

The figures for the job are staggering: more than 105,000 sprinkler heads were installed, with 7,000 of them delivered every week during installation. The 20-member installation team working onsite also had to install six sprinkler pumps with a capacity for 30,000 litres per minute to ensure all areas of the warehouse could be covered in the event of a fire. The finished system needed to have the capacity to pump a staggering 2.7 million m^3 of water in a matter of seconds.

The installation of a fire protection system in such a structure was not just about the size of the job. The dynamics of fire in such a structure also impacted greatly on the design of the system. In view of the warehouse height, a fire would spread very quickly through its interior, due to the pulling of flames and gases up into the heights of the structure. In accordance with VdS regulations, the sprinkler system was designed to run across different levels of the interior so that in the event of a fire, the trouble spot could be identified, reported and extinguished rapidly.

The sprinklers were fitted onto the pipe off-site and then delivered at specified times for installation. Due to the challenges of installing pipe up to 40 metres off the floor, the majority of the 160km of pipe was not welded into place but rather connected using Victaulic grooved end couplings. The increased safety offered by a non-weld installation solution, combined with the reliability of the coupling at high pressures, made it the ideal choice for BLG Logistics.

With the fast moving pace of installation schedules today, it is no surprise that H&V contractors are looking at building speed into their fire protection projects. With research and development breakthroughs such as Victaulic FireLock NXT devices, contractors now have bottom line advantages built into the entire Victaulic fire protection system. With the simple wet and dry functionality of the FireLock NXT devices and the built-in ease of maintenance, the system looks set to be a winner with designers, installers and facilities managers alike and continues to ensure that the fire protection industry can meet the ever more demanding installation schedules being placed on it.

For more information on the Victaulic product range or stockists, call Victaulic in the UK on 01438 310690 or visit www.victaulic.com IFP

Tunnel Vision for Vid

By Ian Moore

Managing Director of D-Tec

Ian Moore, Managing Director of D-Tec – part of AD Group – considers the key issues surrounding tunnel fire safety – specifically with regard to the growing application of CCTV technology in road, rail and service tunnels where a rapid response to potential incidents is so critical – and highlights the positive experience on the ground of those who have adopted advanced Video Smoke Detection (VSD).

Challenging Environment

There is little doubt that the confined nature of a tunnel – by virtue of a small cross sectional area – presents a uniquely challenging environment where fire safety is concerned. Factors such as the length of tunnels, with some now stretching more than 50 km, the difficulty of access, and the higher heat release rate from fire, make any delay even more critical when it comes to the potential for a blaze to be tackled and, crucially, those inside to be evacuated.

Against the backdrop of a number of major fire related incidents over the past decade, including the Mont Blanc Tunnel in 1999 which sadly claimed the lives of 39 people, a funicular railway tunnel fire in Kaprun, Austria, two years later where 155 died, and in March this year a fatal fire in the Melbourne City Link Tunnel, there has been increasing interest in the application of CCTV cameras in conjunction with video analytics technology, specifically video smoke detection, to provide vital early warning of incidents.

As time is always critical with all fire detection systems, it is clear that smoke detection is needed

eo Smoke Detection

and not heat detection to attain this advanced notice of impending danger. Sadly the reality is that in the past many people have perished by the time a heat detection system has initiated due to smoke inhalation and – in road tunnels – the accidents caused through a lack of vision for drivers.

Smoke detection in road tunnels was a previously unsolvable scenario due to the dirty environment that not only would have created many false alarms – as a result of vehicle exhaust fumes – but there was also the near impossible task of maintaining any devices to be operational within their limits. VSD due to its design and complex algorithms can overcome these problems.

Anatomy of VSD

Looking in more detail at VSD this approach, initially developed for the nuclear industry, works by utilizing standard CCTV images in real-time – from up to eight cameras simultaneously – that are then analysed by specialized image processing software. This seeks out the particular pattern that smoke produces by applying extensive detection and known false alarm algorithms.

By programming the software to look for anticipated motion patterns of smoke over a specified area within a camera image, and analysing pixel changes, VSD has the potential to deliver an exceptionally fast response – typically in seconds. Crucially, once smoke has been detected the system can alert the operator as well as delivering a visual representation of the smoke on the system's monitor.

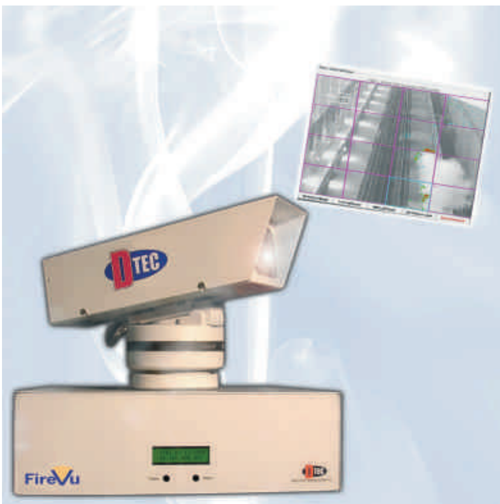
This ability to effectively detect smoke at source, unlike more traditional methods, means that VSD does not have to rely on the proximity of smoke to a detector and is therefore unaffected by distance. Whether the camera is situated 10 metres or 100 metres from a risk area, VSD has the capacity to detect smoke in the same amount of time, providing an early warning that would be impossible with conventional detection.

In addition, as the location of smoke can be readily identified by using cameras at multiple points, the VSD system can supply valuable management information, allowing passengers or commuters to be directed safely away from any incident whilst avoiding the most dangerous areas – this situational awareness is particularly beneficial in tunnels with a gradient where smoke as it rises will tend to gather more on a particular side of a fire.

It is important to stress that VSD is distinct from other camera-based detection systems which are in reality motion detectors or obscuration-change detectors that are unable to differentiate between smoke and other sources of movement and are so liable to generate a high level of false alarms. This is not the case with VSD whose sophisticated algorithms allow it, for example, to readily distinguish between smoke and steam which can prove problematic for other solutions.

Early Warning for Sydney

When it comes to the practical application of CCTV camera-based Video Smoke Detection (VSD), with regards to tunnels, the AU$554 million Sydney Harbour Road Tunnel – the largest

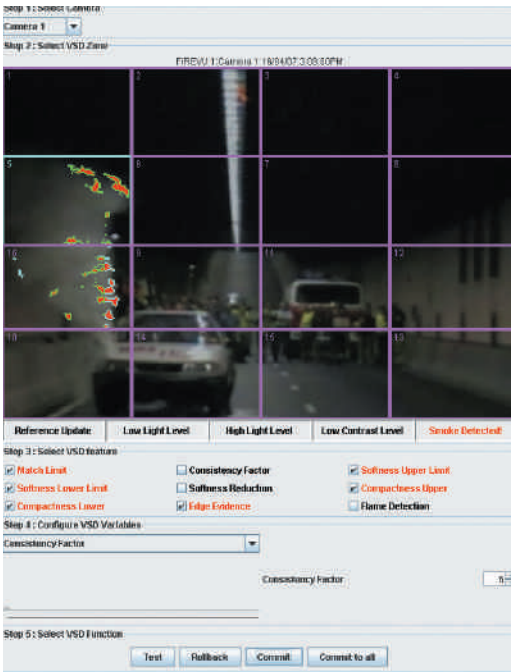


privately-funded public works project in Australia – offers an impressive reference point in terms of the capability of this FM-approved technology to provide a rapid response to potential fires.

In this case, working closely with D-Tec's Australian agent, Chubb Fire Safety, VSD was retrofitted to 80 of the tunnel's CCTV cameras – 40 in each tube – offering a vital early warning of incidents in the tunnel which carries nearly 90,000 vehicles a day.

When the Sydney Harbour Tunnel was constructed, back in 1992, it was fitted with the best fire protection systems available at that time.

These measures consisted of thermal point detectors spaced every 15 metres over each lane; more than 40 CCTV cameras – an additional 48 cameras were installed in 2000 – facing oncoming traffic throughout both tubes; complimented by a



manual deluge system operated from a dedicated 24-hour manned control room in North Sydney.

The catalyst for the move to implement a new D-Tec Video Smoke Detection solution came from an ongoing programme of intensive training and monthly maintenance by the Sydney Harbour Tunnel Company (SHTC).

With advances in technology, the tunnel's management was keen to look for more effective systems of fire detection. In conjunction with the Sydney Fire Brigade a series of controlled vehicle fires were created to test the tunnel's exhaust system's ability to remove smoke, the activation of the point detectors, and the capability of the deluge system to suppress a fire. At this stage the SHT management invited us (D-Tec) and our Australian agent Chubb Fire Safety to take part in these tests and trial the state-of-the-art Video Smoke Detection system (VSD).

Testing Times

During the live burning of the vehicles, temperatures at the fire site reached in excess of 500°C. All cameras in the fire's direct field of view were totally obscured within 25 seconds. The operation of the deluge system was delayed in order to allow the fire to develop and for a large volume of smoke to spread along the tunnel. Activation of any of the tunnel's alarms was monitored. After approximately five minutes, and a full blown fire with extreme temperatures, the deluge was operated and the fire contained.

The live images of the fire were screened through the VSD system and the first alarm was generated in 14 seconds of visible smoke and prior to any visible flames, a further 30 alarms were generated during the remainder of the test burn. This was in stark contrast with the existing solution. At no point during the tests did any of the older automated systems within the tunnel generate an alarm.

As a result of the successful tests, the VSD was then procured by the Sydney Harbour Tunnel Company (SHTC) to cover 80 of the tunnel's

existing CCTV cameras. The solution is capable of providing real time images and has a storage capacity of up to 5000 watermarked bitmap images. For the Sydney Harbour Tunnel the VSD hardware transmits its alarm signals to a dedicated NFP2 Chubb fire panel. The NFP2 then provides a visual and audible alarm within the tunnel control room and generates an interactive mimic panel via a graphic interface package known as "Digifire".

The system was commissioned with the full co-operation of the SHT control room staff and management and handed over in May 2006. Since that time thankfully the tunnel has been free from real time incidents. The fatal fire within the Melbourne City Link Tunnel in March 2007 reminds us that we must remain vigilant at all times.

Making the Right Connection

Looking ahead for future tunnel projects, whether it be protecting road tunnels in Italy or service tunnels in Dubai, from our perspective we see the trend in VSD moving towards systems which come with a networked capability so any solution is not limited to being monitored locally on site.

Now with the latest IP enabled systems, such as our own FireVu, there is the potential to offer 24-hour remote monitoring and fast response to incidents, with alarm and associated video image distributed to an unlimited number of locations for review by using a network's TCP/IP (Transmission Control Protocol/Internet Protocol) as the communications backbone.

As all alarm events are recorded on the system's Digital Video Recorder (DVR) these can be readily accessed for pre and post-event analysis.

A key advantage, from a tunnel operator's perspective, is that one control centre can potentially be used to monitor a number of FireVu VSD tunnel installations. Crucially there is virtually no limitation on the distribution of alarm information as FireVu can be monitored on any PC. System faults are also reported via IP, and alarm information can be sent by SMS (Short Message Service) and MMS (Multi Media Service) to mobile telephones, hand-helds and via email.

As FireVu uses TCP/IP as the communications backbone it also allows easier and faster monitoring and diagnosis of installations, and hence the quicker resolution of any maintenance issues.

In addition, as all alarm events are recorded on the system's Digital Video Recorder (DVR) these can be readily accessed for pre and post-event analysis, allowing the operator to view what, or who, caused the incident. This ability can help to identify any changes that need to be made to a tunnel's Fire Safety plan.

Reconfiguring the FireVu system – when alterations have been made to the facility being protected – can be also carried out remotely, removing the cost and delay associated with travelling to the site.

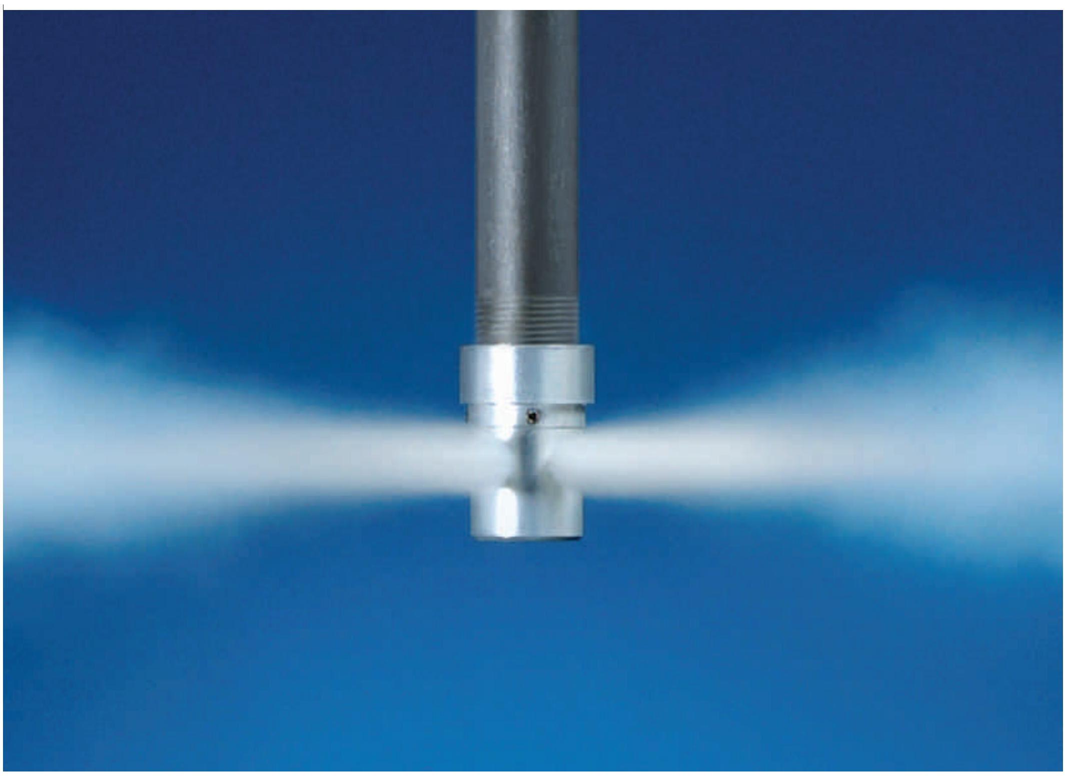
A Wider View

Significantly, FireVu – which shares a common NetVu Connected technology base with other AD Group systems and its NetVu ObserVer GUI (Graphic User Interface) – has the potential to be integrated with a broad range of facilities management measures and security systems. This opens up the prospect of the same interface to be used to call up images associated with a fire incident and a criminal attack.

Ultimately, we are likely to see many more examples of CCTV being applied intelligently to deliver fire safety benefits in areas such as tunnel safety where there are critical gaps in the capability of existing, conventional, alternatives. This is underlined by the fact that when time is of the essence it is smoke and not heat detection that has the real potential to save lives.

Further details on D-Tec, VSD and FireVu can be found at www.dtec-fire.com. Copies of the company's sales literature are available on tel: +44(0) 870 458 1517, by fax on: +44(0) 870 458 1518 or via email: sales@dtec-fire.com IFP

HFC Clean Agent in Health Care F



In hospitals, clinics, infirmaries, hospices and doctors' offices around the world, health care administrators are responsible for protecting patients and providing a safe environment for their recuperation. In the event of a disaster, such as a fire, personal safety of patients and staff is at serious risk. Fire in health care facilities also jeopardizes high-value medical equipment that is essential to patient diagnosis and treatment.

By Ken V. Blanchard

Global segment manager, DuPont Fire Extinguishants

Additionally, longer-term continuity of care is threatened when equipment is damaged or data is inaccessible, resulting in potential losses and liabilities that can extend well beyond the occurrence of a fire. The National Fire Protection Agency (NFPA) reports that during 1999-2002, an estimated average of 3,150 structure fires in health care facilities, excluding nursing homes, occurred each year. Seventy-four percent of the fires in this group were in hospitals or hospices,[1] suggesting that health care facilities face a significant threat from fire and subsequent damage.

This article will outline the key fire safety concerns, such as patient safety and potential damage to sensitive medical equipment, that are important for health care administrators to consider when evaluating fire extinguishing solutions. It will also demonstrate how hydrofluorocarbon (HFC) clean agent fire extinguishants can address those concerns. Finally, it will describe how two health care facilities are using HFC clean agent fire extinguishants to protect staff, patients and the equipment that helps provide essential medical care.

Fire Safety Challenges

Health care administrators face several unique challenges related to protecting staff, patients and life-saving equipment from fire. Therefore, it is important to keep in mind a number of key issues when selecting the appropriate fire extinguishant. For example, additional damage beyond heat and smoke may result from using certain extinguishants but can me minimized or avoided by using other extinguishants.

The most critical challenge in health care facilities is protecting the building occupants – staff and patients. Many patients are non-ambulatory and, due to specific medical conditions, may be unable to evacuate without assistance. In other cases, patients may require machines to assist with their breathing or monitor their heart rates, making them more difficult to mobilize in an emergency. Further, the integrity of this life-saving

Fire Protection
acilities

equipment cannot be compromised under any circumstances. Health care administrators need to give careful consideration to following best practices, *versus* minimum standards, to adequately protect sensitive populations and vital equipment in the event of a fire.

Water, the most commonly-used fire suppressant, can cause a range of problems for a health care facility. Specifically, it is electrically conductive and has the potential to cause electrocution to those near electrical equipment. Water damage and the potential for mold are other undesirable after-effects of water fire suppressants.

HFC clean agent fire extinguishants have become a preferred method of protection in recent years, as they are extremely effective and safe for use in areas where people are present. They are also non-conductive, minimizing the risk of electric shock. HFC clean agent fire extinguishants work at a molecular level to cease the combustion process through heat absorption and

Electrically non-conductive and non-corrosive fire extinguishants, such as HFC clean agents, have become a best practice to minimize equipment damage in health care and other high-tech facilities.

chemical interaction, thereby extinguishing fires quickly and mitigating potential effects of smoke and fire. As a result, they facilitate evacuation away from the area of the fire and lessen the longer-term effects of business loss and downtime in health care facilities.

Another challenge for health care administrators is the need to protect sensitive and high-value medical equipment. As stated earlier, according to the NFPA, during 1999-2002, an estimated 3,150 structure fires in health care facilities resulted in $21.3 million in direct property damage.[2] Much of that cost likely stems from having to replace high-value diagnostic technology, such as CAT and PET scanners, X-ray machines and other specialized equipment located in emergency rooms, magnetic resonance imaging (MRI) labs and radiology departments.

Critical medical and patient records, which are often stored electronically, must also be preserved in the event of a fire. While heat and smoke are the probable cause of most fire damage, certain fire extinguishants can be just as destructive. For example, water used as a fire suppressant can

cause electrical equipment to short out and rust. Dry chemical extinguishing agents leave a fine powdery residue that can corrode wiring, damaging equipment and increasing cleanup costs. Repairing or replacing damaged equipment is expensive and may require significant downtime, which is also costly. In a 500-bed hospital, technological downtime is estimated at $264 for each minute lost.[3]

Electrically non-conductive and non-corrosive fire extinguishants, such as HFC clean agents, have become a best practice to minimize equipment damage in health care and other high-tech facilities. HFCs also do not leave fine powder residue behind, which helps to decrease expenses related to post-fire cleanup. Therefore, HFCs have become a preferred extinguishing option in hospitals and other health care facilities where electrical equipment is present.

The presence of combustible material, such as oxygen or alcohol, in medical facilities is another key consideration when evaluating fire extinguishing agents. These substances can add to the fuel load of a health care facility, spreading flames or causing explosions. As discussed above, HFC clean agent fire extinguishants are effective because they cease the combustion process by absorbing heat and prompting chemical interactions at a molecular level to extinguish fires quickly and minimize potential damage.

Finally, when health care facilities are looking for more sustainable fire protection, HFC clean

agents provide a suitable option. Unlike halons, HFCs have zero ozone-depletion potential (ODP) and are not subject to phase-out requirements dictated by the Montreal Protocol. Additionally, they can be used to replace halons in existing systems with minimal modifications.

Protecting people and the medical equipment that saves lives is a priority at health care facilities, and many facility managers are increasingly relying on HFC clean agent fire extinguishants as a best practice in safety.

HFC Clean Agent Fire Protection in Action

The case studies below demonstrate how HFC clean agents are protecting two health care facilities from fire.

Banner Good Samaritan Health Care

Banner Good Samaritan Health Care, based in Phoenix, Ariz., experienced a fire in its electrical room, which supplies all of the cooling for the facility's campus. Since the fire occurred during July, one of the hottest months in Arizona, a loss of cooling capabilities could have been disastrous, but DuPont clean agent fire extinguishants helped to minimize the damage. Banner installed DuPont™ FE-36™, which the fire department used instead of water. Using water in the electrical room would have created shorts in the wiring and could have resulted in electrocution to people in the area. As a result, they were able to extinguish the fire safely and effectively. Although Banner had to replace some equipment, their use of DuPont™ FE-36™ saved the facility thousands of dollars in damage.

Following the fire in the electrical room, Banner recommended that its more than 25 hospitals and long-term care facilities throughout Arizona switch to DuPont™ FE-36™ as a safer fire protection option, specifically for specialized diagnostic and treatment areas, such as MRI labs. Strong magnetic fields in MRI labs limit the type of fire protection system that can be used. Banner selected DuPont™ FE-36™, stored in the Ansul® Clean-Guard® FE-36™ nonmagnetic container, to protect its patients and high-value imaging technologies in the event of a fire. As a result, Banner patients and visitors have peace of mind, and staff can focus on providing the best possible medical care.

Hammersmith Hospital

Similar to many other medical facilities around the world, Hammersmith Hospital in London has a busy radiology room for MRI and X-ray procedures and a corresponding data control room with sensitive electrical systems. The medical equipment housed inside these rooms was protected with a halon fire suppression system; however, as a result of the mandatory halon phase-out in Europe, the hospital's administrator needed to find an alternative fire protection solution that was just as effective as halon. This need, coupled with the responsibility of protecting patients and expensive medical equipment, influenced the Hammersmith staff to install a Fike ECARO-25™ clean agent fire protection system with DuPont™ FE-25™ clean agent fire extinguishant.

Fike and Hammersmith's business partner, Combined Protection Systems, were able to successfully retrofit the hospital's radiology and data control room with the Fike ECARO-25™ clean agent fire protection system because DuPont™ FE-25™ clean agent fire extinguishant easily replaces Halon 1301 in existing systems with minimal system modifications. Consequently, the radiation and data control room experienced little downtime during the Fike ECARO-25™ installation, which resulted in cost savings compared to other systems. These were key success factors of the halon replacement at Hammersmith Hospital.

Conclusion

When it comes to protecting health care facilities from fire, there are many different extinguishing options from which to choose. Therefore, it is important to understand which agents will best address the unique fire challenges that hospitals, hospices and other medical facilities face, such as protecting sensitive human populations and minimizing damage to high-value medical equipment. HFC clean agent fire extinguishants are an effective solution because they have low toxicity. Because they are non-ozone depleting, they are safer for the environment than halon products. They also are electrically non-conductive, and they leave no corrosive residues that may foul life-saving medical equipment. Thus, HFC clean agents have become a preferred extinguishant option among many health care facilities due to their ability to protect what matters most – people and assets, as well as the environment. IFP

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Ken Blanchard is the global segment manager for DuPont Fire Extinguishants. He has been with DuPont for more than four years and has more than 14 years of experience in the fire protection industry. Ken is active with Halon Alternatives Research Corporation (HARC), National Fire Protection Association (NFPA), and other associations, and is based in Wilmington, Delaware. He may be contacted at kenneth.v.blanchard@usa.dupont.com

How to ensure th system performs

Long Gallery at Blickling Hall – protected by a VESDA LaserFOCUS

It is a fact that the vast majority of fire detection systems are never really tested to ensure that they will perform as intended. Granted, functional tests are invariably undertaken during the commissioning stage to ensure that the equipment "works" but in most cases the systems are designed to a set of prescriptive rules using products which have only been type tested. Is this sufficient for high value or high risk applications? – probably not, but is there a better way?

By Peter Massingberd-Mundy

Technology and Expert Practices Manager, Xtralis – manufacturers of VESDA

Fortunately, there is a better way and the many users of Aspirating Smoke Detectors are testament to a detection technique that is regularly tested in the field to meet a suitable performance (not just functional) test. In this article we will focus on the FIA Code of Practise (CoP) for Aspirating Smoke Detector (ASD) Systems which sets out to ensure that such systems are correctly specified, designed, tested and maintained.

Background

The FIA (formally BFPSA) Code of Practise for ASD Systems (hereafter referred to as the Aspirating CoP) was first published in 1996. It was re-issued in December 2005 to reflect changes in BS5839-1:2002 and the impending publication of EN54-20. It has just been republished under FIA banner and is available from their website – www.fia.uk.com/.

With the eventual publication of EN54-20 in June 2006, the Aspirating CoP is the first European Code of Practise to encompass the new sensitivity Classes defined in EN54-20 as it provides recommendations as to where to use each Class and how to install and test them.

The Aspirating CoP

The structure of the Aspirating CoP follows the natural process of realising an ASD system in the field– from initial specification, through planning, design, installation and commissioning then completing the picture with recommendations on how to ensure that an effective ongoing maintenance programme is in place.

There are three key features of the CoP that make it particularly useful. Firstly, in Section 5, it defines a technique for categorizing any ASD system. This sets a foundation for what any particular ASD system is intended for and how it is expected to achieve it. Secondly, there are a series of example forms in Appendix I which, if used, will ensure that essential information is passed

at your detection as intended

through the various stages of a project. Thirdly, there are a series of standard on-site performance tests often called up in project specifications – which is exactly the intention.

The CoP includes a section on Design Considerations and another containing useful suggestions (and warnings) on how to realise the most common applications for ASD technology including protection of EDP areas, warehouse protection, in-cabinet detection, heritage buildings, various harsh environments (inc; cold, wet, hot, dirty and hazardous areas) and duct detection. It also includes sections on design tools, limitation of false alarms and advice on defining and agreeing project responsibilities and variations.

Naturally, there are a number of clear recommendations which are summarised in the text box opposite. For more information (without having to read the full 72 page CoP), Xtralis have published a Guide to the CoP which is being presented at a series of educational road shows during the next 12 months. However, for the purposes of this article I want to emphasis three key features of the CoP namely; the Category definition, the forms and the performance tests.

The FIA ASD Category

As already mentioned, the Aspirating CoP introduces a technique for categorising all ASD systems. Quite simply, it requires that the specifier clearly identifies and communicates the following 4 aspects:

1 The sensitivity Class of the detector (as defined in EN 54-20)
2 The type or method of sampling (e.g. primary or secondary sampling)
3 The intended route to compliance (either prescriptive or performance based)
4 Prime motivators for using an ASD system

More than one of each aspect may be cited in the CoP Category to provide a specification summary.

For example, the exhibition hall in a heritage building may need an ASD with early warning capability so the CoP Category might be a "*Class B* detector providing enhanced *secondary* protection to *BS5839-1 spacing* but also required to pass the CoP hot pellet test (appendix B) and thus provide protection of the valuable assets with minimal interference to the aesthetics". A good example of this was the protection of the Long Gallery at Blickling Hall where a VESDA LaserFOCUS detector was installed for aesthetic and early warning reasons (see photo). In EN 54-20 terms it was configured as a Class B detector to ensure compliance with the commissioning tests defined by the National Trust.

For a second example consider protection of an aircraft hanger where a "Class B detector is required to provide protection of the hanger using spacing to VdS 2095 (the German equivalent to

The key recommendations of the Aspirating CoP

- One organization should be designated to take overall responsibility for the performance of the ASD system
- Use only Class A or B for primary sampling (across air vents)
- Maximum zone size is 2000sqm
- Only install ASD in place of points where the manufacturer can present appropriate product approval certificates
- In all other cases a performance test should be specified and undertaken at commissioning
- Spacing recommendations for secondary (ceiling) sampling should follow appropriate codes for point detectors
- Spacing recommendations for primary sampling (across air vents) is given in section 8.3.2.1
- Vertical spacing (where applicable) will be 3-8m
- Don't use open end caps – only use vented end caps to decrease transport time if modelling software shows it is needed
- A maximum 2 minute transport time is recommended
- Sensitivity of each sample hole should be better than 5% obscuration/m unless otherwise stated in the manufacturer's approved documentation.
- Use a water trap if internal condensation is a risk
- Regular smoke testing is recommended where additional filtration is used in dirty/dusty areas
- Flow reading observed at commissioning should be recorded for reference during future maintenance
- Maintenance tolerances/limits and frequency should be set at the design stage
- PSUs should meet EN54-4 and their ability to report faults should be checked during commissioning

Hot Pellet tests on a VESDA LaserPLUS in a Hanger in Germany

Hot Pellet tests on a VESDA LaserPLUS in a Hanger in Germany

BS5839) but must also register a pre-alarm (Action) to the CoP Hot pellet test (appendix B) to achieve adequate protection of the high (25m) hanger where maintenance access is challenging." This is illustrated in the example from Dusseldorf Airport, where smoke tests were successfully conducted by VdS on some trial installations of VESDA LaserPLUS.

For a third example consider a warehouse where an automatic foam extinguishing system is installed. For this project (at Jotun Paints) the CoP Category would have been expressed as a "Multi-class A & C detector using in-rack sampling to provide the earliest possible warning (Class A) of a smoke condition while also providing a less sensitive (Class C) threshold to interface to the foam extinguishing system. Early warning shall detect the Aspirating CoP Hot pellet test (Appendix B) while the Class C threshold will activate when a 100 litre container of paint solvents and pigments is burning."

What all three examples have in common is that there *is* a performance requirement. However, in many projects there is no performance requirement and the ASD system is being installed for access, maintenance or aesthetic reasons only – where the anticipated detection performance is as per normal fire point fire detectors. In these "normal risk" cases, it is very reasonable to apply the same "prescriptive based" compliance process as is applied to point detectors. i.e. space sampling holes to established point detector spacing requirements and get assurance that one hole is at least as good as a point type detector. The best assurance is to use a detector which is supported by good modelling software (backed by solid empirical testing) that proves the equivalence of sampling holes to a point detector. The Aspirating CoP clearly states in section 5.2.2 that:

It is recommended that Secondary detection based on prescriptive spacing codes and standards is only used when the manufacturer of the ASD system can present appropriate product approval certificates.

Furthermore in 14.2.1 it provides the following advice for the commissioning engineer:

When using ASD to replace point type detectors (Class C), – ensure the installation (particularly sample point spacing) conforms to the relevant standard (e.g. BS 5839-1: 2002) and the ASD sensitivity/alarm thresholds are correctly set to ensure that the sensitivity of individual holes meet the minimum performance requirements for individual points. Note that this may require reference to the approval compliance notes for the particular ASD system and should also take into account any potential automatic adjustments of the sensitivity/threshold settings, which may occur after commissioning.

While the more established high sensitivity ASD systems have gained an excellent reputation, by offering stable and reliable detection supported by global 3rd party approvals, some ASD systems are not so reliable and do not carry any approvals. Others constantly adjust their alarm thresholds based on the background reading. As such there is a risk that they may become so desensitized that individual holes are no longer as sensitive as a point detector. Such a situation challenges the fundamentals of the prescriptive design. Most alarming is that it is not unknown for installers and suchlike to temporarily turn off "smart" algorithms during approvals or commissioning tests with the apparent endorsement of the manufacturer. As such the tests may not be directly relevant to the normal operation of the detector. For an analogy, what is the point of testing your smart toaster if you disable the intelligent browning sensor and test only the underlying timer function – will you be certain to get good toast once the browning sensor is reactivated? If the "smart" algorithms, which generally help to managed calibration drift due to contamination, remain deactivated then the detector will be prone

In these "normal risk" cases, it is very reasonable to apply the same "prescriptive based" compliance process as is applied to point detectors.

to either a reduction in sensitivity or false alarms. Unfortunately, it remains a case of buyer beware!

The way to ensure that detection systems will work (and continue to work) as intended is to devise (or ask for) a CoP Category statement and require that the forms in Appendix I of the Aspirating CoP are used.

Forms are provided to ensure best practice through the system lifecycle. There is a form to support the first site visit by the sales engineer who will gather information and specify the essential requirements of the system. The form for the design engineer, who typically lays out the details of pipe work and sampling hole locations, ensures that the sensitivity settings and the maintenance regime for the system are also defined. The installer's form ensures that the essential connectivity checks (for both the sampling pipe and the power and signal cabling) are recorded and signed off. The commissioning form ensures that all information is available from preceding tasks and that performance results are formally recorded for future reference. To complete the set, the maintenance form provides a record of the regular maintenance checks.

The CoP contains much useful advice and recommendations for all the common applications of ASD technology making it an invaluable reference document for all users of ASD systems.

While these forms will not *guarantee* that the systems will work, they will ensure that the appropriate questions are asked at each stage and that the information is effectively passed on through the project

It is important to use the standard performance tests described in the Aspirating CoP that are most appropriate to the application. To assist in the selection, Appendix A presents a table suggesting where each test should be used. The hot pellet test described in Appendix B is undoubtedly the most useful and has been in the CoP since 1996. The paper burn performance test is described in Appendix C and the enamel wire test is described in Appendix D. Both have been included to support one particular type of detector and consequently do not appear in the table in Appendix A. Appendix E defines the well established hot wire tests (1m, 2m and 2x1m PVC) which have been specified by many IT and telco companies. This test has been adopted into the US based NFPA codes and is being considered for inclusion in some European codes. Most importantly, in support of the increasing adoption of LSF (low smoke and fume) cable, Appendix E now provides for "equivalent lengths" of LSF wire that are anticipated to produce similar quantities of smoke to the PVC cables. Anybody with experience using these "equivalent lengths" in the field are invited to contact the FIA ASD task group to share their experience. Appendix F defines a new

Ad hoc test in a paint store protected by VESDA LaserPLUS in the UK

resistor based test for testing ASD installed for in-cabinet protection. This test is based on extensive lab work but again feedback from the field would be most welcome. Appendix G presents the EN54 Polyurethane mat test which is used extensively and successfully in France for field commissioning of normal sensitivity detection systems. Finally, Appendix H presents the Potassium Chlorate & Lactose test which is not used widely on account of it being quite intense. It may be considered for omission in the next release so any users of the test are encouraged to contact the FIA ASD task group.

With these performance tests, a set of forms and a technique for categorizing any ASD systems, the Aspirating CoP provides the framework for ensuring that an ASD system performs as intended. Furthermore, the CoP contains much useful advice and recommendations for all the common applications of ASD technology making it an invaluable reference document for all users of ASD systems. Most importantly, the Aspirating CoP sets an excellent example for the entire fire industry for *performance based* design while retaining essential recommendations pertinent to *compliance based* design – i.e. to ensure a system performs as intended it must either be performance tested on-site OR deploy products that carry product type approval supported by appropriate installation rules and tools. IFP

Good People Needed!!

This is being written shortly after the Association for Specialist Fire Protection (ASFP) AGM, which was attended by the Association's ex-Technical Officer, Ron Smith. Ron spent 15 years with the ASFP as an employee. "Good God", I hear you say, "what did he do to deserve this sentence? He could have got out of jail, with time off for good behaviour, long before this even for some major misdemeanour!"

By Graham Ellicott, Association for Specialist Fire Protection (ASFP)

But it doesn't stop there. Ron was allowed by his employer, prior to the ASFP, to spend some of his valuable time helping the Association to work for the general good of the fire protection industry. So Ron spent the best part of thirty years in and around the ASFP.

OK. So what am I getting at? Well the truth of the matter is that the number of people with Ron's ability is limited and the shortage is compounded by the decision taken by some companies to deny their employees spending time working for the long term good of the industry.

"But hang on", says the MD of one company, "Why should I allow my resources to assist in generating business opportunities for my competitors?" Well, one reason is that the UK, like it or lump it, has performance based building regulations and thus, it falls to industry to work together in order to bring some 'regulation' to what otherwise would be a free for all.

"But hang on", says the MD, "My organisation has acquired and consolidated many of the companies in my business sector, so why do I need to allow some of my assets to work for a trade association when I already enjoy the major part of this sector?" It's a good point, but that doesn't mean that you alone can bring about the changes necessary to maintain your level of success in the years to come.

"Hang on one more time", says the MD, "My shareholders employ me to make the best use of the tools at my disposal, so that their dividends can arrive on time". Now we are getting closer to the truth! In my opinion short term profits and goals, particularly in publicly quoted companies have, for many, replaced the longer term good of their business and thereby that of the total business.

"But just one more thing", says the MD, "I sign a cheque to be a member of a trade association every year, isn't that enough?" Well, Mr. MD, Associations are of course grateful for your contributions, but they also need input from your people.

But why is that input needed?

There are several reasons. They include fact that Government likes to deal with as few people as possible and thus, it likes to deal with sector groups that represent a specific part of industry. It also wants to deal with people that have an informed current view on what is going on and that can only come from those people that are currently in the business.

But this applies not just Government. It is also relevant with standards bodies, our peers in Europe, visitors to our seminars – all of these guys want to hear from knowledgeable people. They don't just want to hear 'hackneyed' phrases from trade association employees.

So please, Mr. MD, let some of your knowledgeable employees spend some of their time working for the long-term good of the industry. In the long run this will repay you many fold in increased business.

But, back to Ron Smith. One of the many things to be learned from him is that, in the trade association business, you have to listen to the members and that you should encourage them to be involved where appropriate. If they are totally unable to spare the time, get their input and impart the message yourself.

So, to paraphrase Lord Kitchener, "Your industry needs your people and their input". In the longer run, if the people cannot be spared to spend some time working for the good of the industry, all the excellent work of the Ron Smith's of this world will be undone. IFP

So what was all sandwich panel

Boldon School had certain concerns about insurers' requirements plus a desire to increase levels of sound and thermal insulation. Europanel from Eurobond provided the right solution

Composite sandwich panels can be extremely cost effective in the construction of new buildings, but have all the 'old' problems gone away?

Are there new problems around the corner?

This article suggests there may well be new 'concerns' ahead.

By Bill Parlor

Technical Officer ASFP

Over a period of about 7 years or more centred on 1993 to 2000 many fire brigades and insurance companies witnessed fire losses involving sandwich panels first hand, epitomising the inadequacies of over-reliance of Class 0 when used in isolation. The 'problems of fire' in relation to poorly selected composite sandwich panels had well and truly arrived

Finally in the new millenium, partly because of the real possibility of *very sudden change* in risk from fires involving sandwich panels, and threats to fire fighters and occupants alike, government published new guidance as a new Appendix F in Approved Document B – Fire Safety: 2000. Interestingly, the guidance provided was limited to the sandwich panels when used internally to buildings, and seemed to stand aside from panels used as external cladding to buildings. The guidance highlighted:

- Fire behaviour of core materials and fixing systems
- Firefighting problems
- Design recommendations
- Appropriate core choice for named uses

At much the same time, insurers were also readdressing the issues and this finally emerged as repositioned Loss Prevention Standards LPS 1181 Parts 1 and 2 for panels used externally or internally in buildings respectively, with designations like EXT-A30 or INT-1, 2 or 3.

What is tested and to what fire exposure?

Firstly, let's consider the Insurer's LPS tests.

REACTION TO FIRE

Both types of panels, for external or internal use, are tested using the long established 'Wall and Ceiling Lining' test room arrangement. Simply stated this is a 10m long room, 4.5m wide by 3m high with a 0.75m downstand at the open end. An adjustable window in one wall near the 'hot end' allows ventilation to the fire source, but this is where the 1st variation can arise.

In the case of external panels, the room is formed by panels fixed to a steel frame. *External panels have complex 3D jointing*

the fuss about s?

systems, with and without cover strips.

In the case of internal panels, the room is formed by free-standing panels fixed to each other, and ceiling supported from a suitable framework, so the support is quite different. *Internal panels have simple butt jointed edge to edge construction, but are usually retained in channels at top and bottom edges.*

Usually, the LPS 1181 fire source is from a burning timber crib, raised off the floor adjacent to the corner of the far end panels. The crib design is critical as it effects the rate of burn. Within 24 hours of the test, after cooling down, the extent of the damage to internal and external panel facings are measured; the internal facing is removed to check damage within the panel,and the depth of char of the internal insulation. If the results fall within set reference limits, the panel system as tested gains EXT-B status for Reaction to Fire testing. EXT-A is not yet achieved.

Note that assuming a successful test result, sandwich panels tested with long side edges horizontally can be used in vertical condition as well, but if tested with long side edge in the vertical orientation, then it cannot be assumed as suitable for horizontal use as well.

Importantly too, if test are made with different combinations of insulation to wall and roof panels, then the results are limited to those combinations as tested, so for example if the test is made with foam core to the walls and mineral wool core to roof, the test results are not applicable to panels with foam cores to walls and roof!

Test data is also limited to the panel thickness, as tested, or a lower thickness.

So far so good.

When panels are intended to be used internally within buildings, LPS 1181 Part 2, has an additional requirement beyond LPS 1181 Part 1. For 60 minute INT-1 Classification, the severity of the fire source is increased and a propane gas burner is used instead of the timber crib. The gas burner peaks at 1000KW fire exposure and is held at 600 KW until 30 minutes have elapsed. Compare the the timber crib which reduces to about 150KW after 10 minute or so. The timber crib is used for external panels and also for internal panels to meet less severe 30 Minute INT-2 and INT-3 classifications for reaction to fire testing.

Do note that the 60 minute and 30 minutes durations originate from separate resistance to fire testing – as indicated below.

RESISTANCE TO FIRE

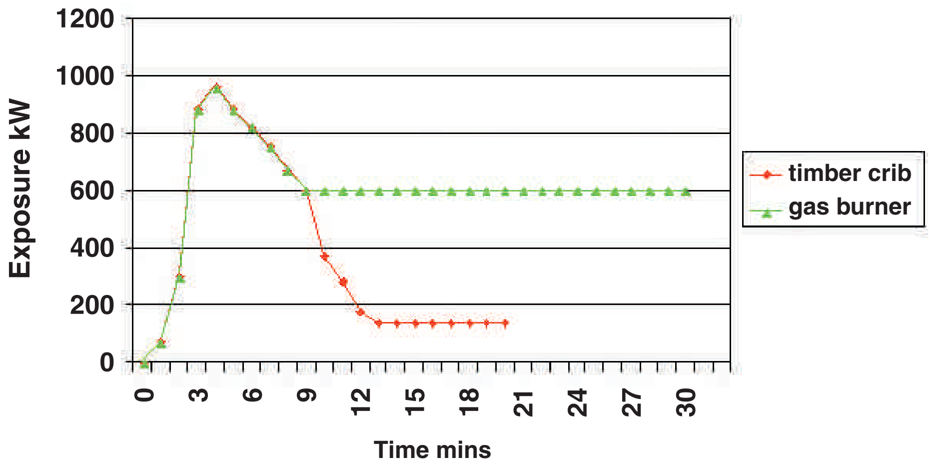
Sandwich panels can only be classified as Grades EXT-A60, A30 or A15 and INT-1 or INT-2 if fire resistance testing to LPS 1208 [BS 476 Part 21] is also carried out.

Note that 27 minutes insulation is deemed acceptable for EXT A-30 panels.

EXT A-15 is deemed acceptable by LPS1181-1 for external sandwich panels that are NOT within the unprotected are as defined in Approved Document B, but in the 'protected zone' on either side of a compartment wall, the fire resistance needs to be higher.

This is to be contrasted with sandwich panels used for internal divisions of space in buildings, where fire resistance performance has to be demonstrated for 60 or 30 minutes integrity and insulation for INT-1 and INT-2 grades respectively. So its tougher to satisfy insurers for panels used inside buildings! I wonder if BCO's realise this.

LPS 1181 part 2 – heat exposure kW



NB – The gas burner allows an ENHANCED fire exposure for 30 minutes, whilst timber crib has lower exposure between 9 to 20 minutes.

Pic courtesy of Promat

FIELD OF APPLICATION OF TEST RESULTS
Of course we cannot test everything since the cost would be prohibitive. So we test agreed arrangements and apply rules for extending the test data to 'EXTENDED' fields of application. This is where new concerns start to appear.

LPS 1181 Part 2 and LPS 1181 both contain rules for 'field of aplication of test results'. In the case of external panels, these rules relate to product type, thickness, height, orientation, depth of profile, etc. – whereas for internal panels similar rules exist but additional ones also appear for unsupported span of ceilings, support distances of fire resisting panels, etc

European product standards and field of application of test data

The European product standard EN14509: 2006 has now been released by CEN TC128 'Roof covering products for discontinuous laying and products for wall cladding' However, dispute continues over the rules for the field of application of test results contained in the document, since some rules are included in the Product Standard which are not agreed in CEN TC127 Fire Safety.

To help clarify the primacy for ownership of such rules CEN Management released a letter, clarifying that promacy lies with fire test committees in CEN TC127.

The following extract is a letter written 2007-03-05 by CEN Programme Manager, to the various CEN Technical Committee Secretaries

At the CEN/TC 127 "Fire safety in buildings" plenary meeting held on the 30th October 2006, the issue on the TC responsibility for drafting standards related to fire was raised by some of the participants. It is understood that some product Technical Committees are involved in drafting standards on reaction/resistance to fire, which is within the scope of CEN/TC 127 alone.

CEN/TC is responsible for drafting standards on reaction/resistance to fire linked to all the construction products and it is supposed to have the expertise to draft them.

This issue was already discussed several years ago and the situation has not changed. At the meeting of the 30th October I made it clear that CEN/TC 127 has the mandate for drafting all reaction to fire and fire resistance test standards. This includes test methods and Extended Application standards (EXAPs). Therefore, CEN/TC 127 has primacy over all other TCs.

However, if there are areas in which CEN/TC 127 does not have the expertise or is not currently involved with the preparation of the required standards, or does not have the required resources, then other CEN Technical Committees could take the lead, but they should make CEN/TC 127 aware of their needs in the first instance.

I take this opportunity to ask the CEN Technical Committees drafting construction product standards to establish close liaisons with CEN/TC 127 to support its work.

What does all this mean?

It strongly suggests that when the next public review of EN 14509 'Self supporting double skin metal faced insulating panels – Factory made products – Specifications' comes along by 2011, existing rules for application of test results as presently contained in EN 14509 may be changed, at the insistence of CEN TC127. This also means that some 'approved' product through the EC CEN route could be less acceptable in the future – what price the risk assessment at that stage? Therefore the inconsiderate publication of EN 14509, ignoring CEN TC127 concerns, may be a recipe for chaos ahead. I'll not comment on the politics of such an action.

It should be pointed out that the EXAP Rules in EN 14509 also go further than the permitted limits in insurers' standards LPS 1181 Parts 1 and 2, so it would be prudent to accept insurers conclusions in the interim period.

Changes in UK Law

Are there any issues arising from recent changes to fire law?

- Fire safety order 2005:
  Places a duty on responsible persons to make a useful risk assessment
- CDM Regulations 2007:
  Builds on existing law to ensure that clients know what they are getting. They should not be misled.
- AD/B 2006 Appendix G
  Regardless of the Appendix F introduced in 2000, readers should familiarise themselves with the new Appendix G 2006. This refers to a new Duty such that fire safety information shall be given to the 'responsible person' at the completion of a project or when the building or extension is first occupied. [Fire safety information means information relating to the design and construction of the building – including all assumptions made in the design of the fire safety arrangements.]

Aston-under-Lyne's new Ikea store was partitioned using Eurobond Firemaster panels which provide the highest level of fire resistance, reducing the risk of flame spread in the event of a fire

Insurers

Insurers have previously published their Essential Principles document – a short overview of must do actions. Principle 1 of 10 includes – 'compliance will be deemed to have been satisfied if if the products used ar non-combustible; Euroclass A1 or A2, or are approved by LPCB to the Appropriate part of LPS 1181'. We have outlined some of the key factors above.

In summary

- Correct panel selection is just as important now in 2007, as before.
- Ensure that the scope of agreed use is fully appreciated, as documented.
- Check the fixings required for claimed Resistance to Fire performance. Do check the details in the test reports.
  This is vital for use of panels in the Protected Zone either side of all compartment walls in buildings where they meet the cladding and roof.
- Appreciate that the Reaction to Fire test conditions are properly understood.
- Ensure that your insurer agrees with your conclusions. IFP

Safety with creativity

SCHOTT Pyran and SCHOTT Pyranova fire resistant glazing for maximum safety and freedom of design

Improvements during the past few years in fire resistant glazing mean that architects and designers donít have to compromise their designs even longer. SCHOTT fire resistant glazing enables architects and designers to create and build impressive buildings, that are functional, more aesthetically pleasing and safer.

By Anke Koenen

Schott Jenaer Glas GmbH

Why to use Fire Protection Glazing?

Fire Resistant Glazing are essential to fire safety. Its application is strictly dedicated by norms and regulations which differ from country to country. But the sense behind using Fire Resistant Glazing is the same everywhere: avoiding the occurrence of fire; avoiding the broadening of fire and smoke as well as securing rescue and extinguish measures. Therefore – depending on the national codes – the application of fire resistant glazing is specified. Possible application fields are partitions, doors, transoms, facades or roof glazing in hospitals, hotels, administration buildings, shopping malls, schools, airports, stadiums, theatres, passenger ships, leisure parks, industrial plants – so mainly public buildings with high appearance of people or value.

Fire resistance categories for individual protection requirements

Fire Resistant Glazing are tested acc. official standards in a testing furnace of an official laboratory as a whole system. The furnace is simulating a fire on a 1:1 specimen with a standardized temperature curve. In dependence to the duration, the fire resistant glazing withstands the testing conditions, they will be classified into E or EI glazing of 30, 60, 90 or even 120 minutes. The main differentiation between E and EI glazing types is the thermal isolation. E-glazing provide a physical barrier against flame, hot gases and smoke, while EI-glazing offer additionally thermal insulation up to 140 K in average/total maximum of 180 K on no measuring point. The tested performance of a glazing is written down in test reports, assessments and approvals, which are the precondition to use fire resistant glazing.

Design freedom with internationally approved systems

Fire Resistant Glazing from SCHOTT provides virtually unrestricted application options, both for internal and external surfaces. The basis for this wide scope of use is provided by successfully passed standard tests and approval processes to national and international standards.

SCHOTT's Fire Protection Glazing Pyran and Pyranova have been tested for use in frame constructions of timber, steel, concrete and aluminium as well as the frameless butt joint and structural solutions, pioneered by SCHOTT.

Fire Resistant Butt Joint Glazing – the revolution of architecture

Traditional fire rated glazing is usually associated with obtrusive mullions and cross bar constructions which detract from the natural transparency of glass.

This no longer has to be the case as proven by the innovative Pyran S butt joint system from SCHOTT. The impossible becomes possible – the Pyran S fire resistant butt joint system allows the construction of uninterrupted runs of glass without the need for obtrusive framework which can destroy the aesthetic appeal of the line of a building. Large panes of glass are joined with a scarcely visible intumescent sealant to allow the clean look of glass to be exploited to maximum effect.

The Mercedes Myth – shedding the limelight on a brand

The Dutch architects Ben van Berkel, Caroline Bos and Tobias Wallisser had a museum for people in mind when they won the competition for the architecture for the Mercedes Benz Museum in 2002. A museum for people whose visitors move, dream, learn and let themselves be governed by fascination, light and space. However, this shiny aluminium monolith, which gives the appearance of having tightened its belt too tightly, is more than a "mere" collection of milestones from the history of the car written by the Stuttgart car producer.

A clover-leaf-shaped spiral, Wankel engine and a double helix provide the skeletal structure

The architects looked for a never-ending figure as a starting point for the car museum design – the clover-leaf-shaped spiral. The ground plan they developed resembles the cross-section of a Wankel motor: three crescent-shaped sectors enclose a centrepiece, a triangle with convex side pieces. However, instead of stacking the storeys structured in this manner, the architects designed them to wind their way up at a height of 48 metres by means of always using two of the sectors respectively as storey floors whilst the third is located above the curve underneath it as air space. The building has nine such levels on which the visitor can explore the exhibition on two routes, both of which run downwards from the top.

Laminated fire resistant butt jointed Pyran S with screenprinted – the future poses new requirements, Schott fulfils them now

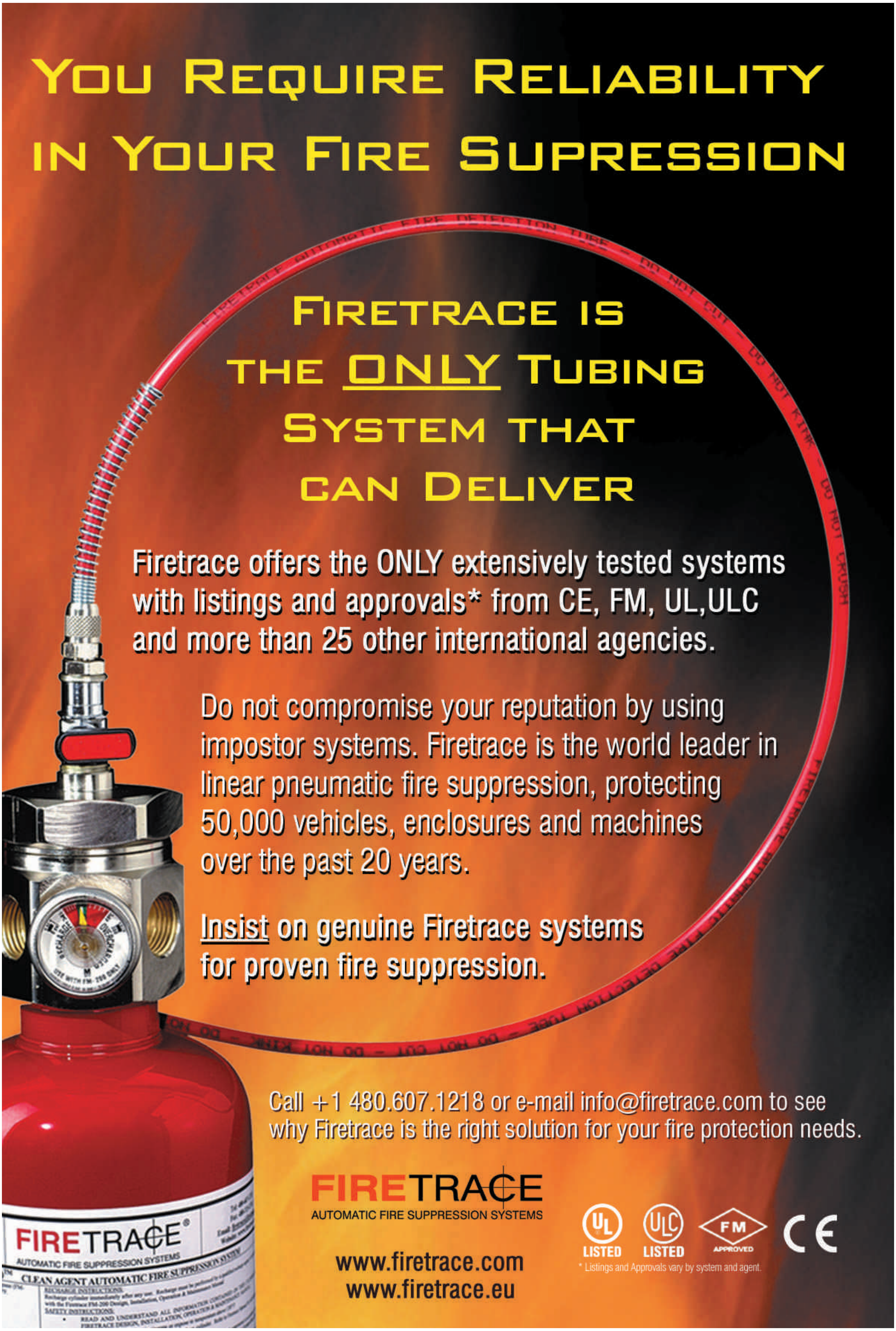
The fire protection requirements for the fixed glazing on the top representative level, the starting point for both tours which additionally includes a representative event zone, were especially highñ technically speaking, of course, but above all with regard to the design employed. E30 was required for both the glazing between the event area in front of which the foyer is positioned and the "Walk round the corridor of legends" on the one hand and the concluding fixed glazing from the foyer to the atrium on the other hand. Moreover, the glazing was meant to obviate the need for security railings.

The fire-protection glazing to the atrium is room-high and the approximately 50m-long glazing between the "Walk round the corridor of legends" and the event area or the height of the foyer located in front of the event area is adapted polygonally to the rising concrete balustrade. Both fire-protection glazing components were manufactured using Pyran S, a monolithic, thermally toughened borosilicate glass according to DIN EN 13024. However, in order to guarantee the glazing's additional function of obviating the need for security railings, laminated glass consisting respectively of two panes of Pyran S was built up.

The architects wanted a construction which is as filigree as possible, without any posts which disturb; therefore both parts with fixed glazing were implemented using vertically joined fixed glazing with vertically butt jointed panes. Thus, in particular the run of the extravagant pattern designed by the UN studio (which was applied to the panes using serigraphy in two colours) is well-shown to its advantage. Moreover, the panes are made and arranged polygonally according to the height development of the concrete balustrade. At the Mercedes Benz Museum nearly everything is unique.

The best remedy for exciting design: reassuring safety

Modern architecture has a very high potential – new technologies and design-orientated perspectives give new inspirations and possibilities. In case of fire resistant glazing, pure protection gets a basic meaning. The more they are integrated and adopted to the normal building the better it is. High sophisticated or functional buildings are state of the art. That's why also fire resistant glazing has to develop. Frameless butt joint solutions, structural glazing systems, double glazed units with integrated blinds, bent glazing, design by screen printing or sandblasting – these are options modern fire resistant glazing may offer to inspire the architects to create futuristic and energy efficient buildings. IFP


YOU REQUIRE RELIABILITY IN YOUR FIRE SUPRESSION
FIRETRACE IS THE ONLY TUBING SYSTEM THAT CAN DELIVER
Firetrace offers the ONLY extensively tested systems with listings and approvals* from CE, FM, UL,ULC and more than 25 other international agencies.
Do not compromise your reputation by using impostor systems. Firetrace is the world leader in linear pneumatic fire suppression, protecting 50,000 vehicles, enclosures and machines over the past 20 years.
Insist on genuine Firetrace systems for proven fire suppression.
Call +1 480.607.1218 or e-mail info@firetrace.com to see why Firetrace is the right solution for your fire protection needs.
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AUTOMATIC FIRE SUPPRESSION SYSTEMS
www.firetrace.com
www.firetrace.eu
UL LISTED
ULC LISTED
FM APPROVED
CE
* Listings and Approvals vary by system and agent.

Figure 1

Technical Report – Firetex Thin Film Intumescent Coatings

Fire Resistance Beyond the Requirements of Building Regulations

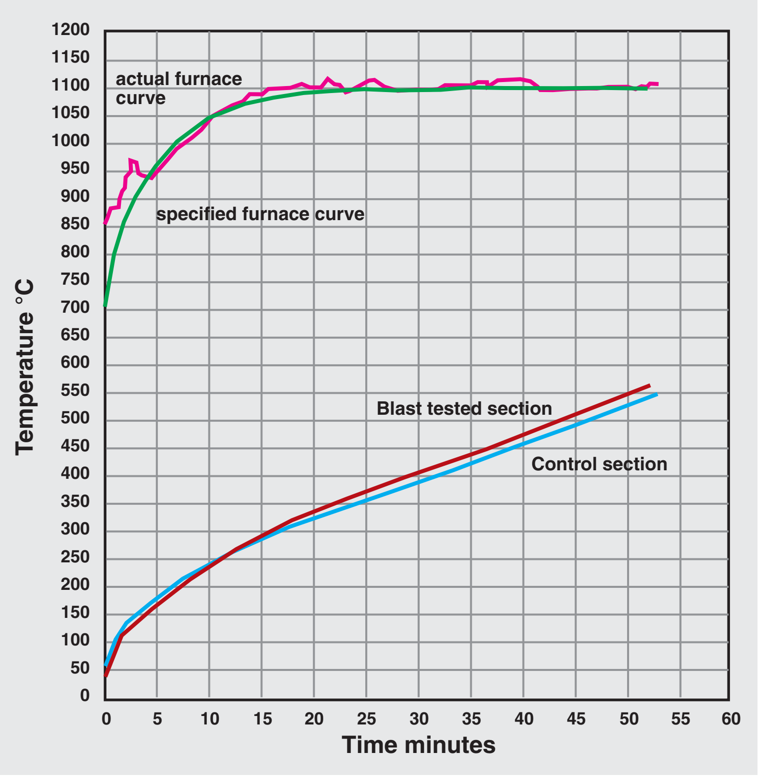
The Building Regulations for England and Wales, Approved Document B, entitled Fire Safety states "The building shall be designed and constructed such that, in the event of a fire, it will maintain its stability for a reasonable period". What is a reasonable period?

Dr Bill Allen

Director, Fire & Innovation Leighs Paints

The same document gives fire resistance periods in terms of building height and use. These vary from 30 to 120 minutes and also can depend on whether sprinklers (active fire protection) are installed in the building. The fire resistance periods are achieved by applying insulating products (passive fire protection) to the structural steel members in the building. These materials have to satisfy the requirements of BS 476: Part 21 Fire Testing Standard for the period designated by Approved Document B. Essentially this involves testing loaded and unloaded steel columns and beams at a UKAS approved laboratory. The fire test regime is based on a standard cellulosic fire in a furnace where the rate of temperature rise is controlled to meet the standard heating curve. The fire test results are then assessed and the thickness of passive fire protection required for each steel section is determined. One important class of fire protection materials frequently favoured by architects and designers are Intumescent Coatings.

Figure 2



Intumescent coatings react in fire situations swelling to many times their original thickness to produce an insulating char or foam. This char reduces the rate of temperature rise in the steel thus increasing the time taken to reach structural failure.

There is currently no legislative requirement within the UK for structural steel assemblies (where gas, oil and chemicals are not a hazard) to carry out any further testing beyond the requirements of the Building Regulations. Specifically there is no requirement for any testing or approval against the effects of explosion and/or hydrocarbon fire. The writer also believes that a similar situation prevails in the rest of Europe and the USA, where only cellulosic fire testing is required to the appropriate National Standard.

Since the events at the World Trade Center in New York on September 11th 2001 many questions have been asked about the fire protection of tall buildings around the world. In order to provide an additional level of confidence and to address some of these questions in advance of any specific requirements, Leigh's Paints have subjected a number of Firetex intumescent coatings to explosion and hydrocarbon fire.

In the event that an explosion precedes a fire, to fulfil its role in protecting the underlying structure from a fire, the intumescent coating must remain intact and well adhered both during and after the explosion. Therefore Leigh's Paints contracted Advantica Technology (formerly British Gas Technology) to conduct a gas explosion experiment to evaluate the resistance of Firetex thin film intumescent coatings to the explosion.

In addition to the above experiments Leigh's were invited to place a steel column section coated with Firetex intumescent inside a fire compartment in a multi-storey test building at the Building Research Establishment in Cardington. This section of the building was then subjected to a severe natural fire exposure. The performance of this intumescent-coated steel section is also reported in this paper.

There is currently no legislative requirement within the UK for structural steel assemblies (where gas, oil and chemicals are not a hazard) to carry out any further testing beyond the requirements of the Building Regulations.

Gas Explosion experiment

The explosion experiment was carried out on a number of I-section columns coated with Firetex intumescent materials in a 182 m^2 explosion chamber. The average peak over-pressure of 1697 mbar was generated with an average duration of 104 msec.

There was no sign of damage to any of the specimens due to the over-pressure generated by the gas explosion.

The experiment was conducted using an explosion chamber at the Advantica, Spadeadam Test Facility. The explosion chamber shown in Figure 1, measures 4.5 m x 4.5 m in cross section and 9.0 m in length. The chamber has a vent opening on one of the 4.5 m square faces, with all other faces being confined.

The explosion over-pressure produced is adjusted by varying two parameters, congestion and vent area.

Congestion in the explosion chamber is controlled by positioning banks of 0.18 m diameter pipes horizontally, with up to 10 pipes per bank and a maximum of eight banks. Increasing the number of pipes increases the congestion, which in turn has the effect of increasing the magnitude of the over-pressures generated in the experiment.

The area of the vent opening at the end of the chamber can also be varied. Reducing the vent size, while retaining the same internal congestion of pipes, has the effect of increasing the duration and the magnitude of the over-pressure profile.

Figure 3

In this experiment there were 54 pipes and the vent area was less than 10 m^2.

Four universal columns 254 x 254 x 132 kg each 1.6 m in length were positioned horizontally in the vent opening frame shown in Figure 2. The four beams were coated with 1.8 mm Firetex M78, 1.5 mm Firetex FB120, 1.8 mm Firetex M782 and, 1.2 mm of Firetex F908 respectively. The materials were all applied by airless spray.

When the installation of the test specimens had been completed, the vent opening was covered with 500 gauge (0.125 mm thick) polythene sheet in order to retain the flammable mixture within the test rig.

The explosion chamber was then purged with the desired mixture of natural gas and air, both of which were controlled independently until the required gas concentration was achieved. The natural gas concentration was measured at four locations using infrared analysers to ensure a uniform concentration had been achieved.

The test was ignited by a single low energy spark positioned at the back of the chamber opposite the vent opening and behind the banks of pipes.

Pressure transducers were used to measure the over-pressure in the test rig, and video cameras were used to provide visual records of the test.

The average over-pressure measured by the pressure transducers was 1697 mbar, with an average duration of 104 msec.

When inspected visually post-test there was no sign of damage to any of the specimens due to the over-pressure generated by the explosion and the coatings were intact. These tests are reported fully in Advantica Report No. 5539.

This poses the question; how would other fire protection materials perform in similar explosion conditions, and would the material retention be sufficient to offer adequate fire protection?

Following this experiment the test specimens were to further undergo hydrocarbon fire testing at a different facility. To ensure the samples from this test were those used in the later fire tests, each test specimen was signed and dated by an independent witness from Warrington Fire Research who also witnessed the explosion experiment.

Hydrocarbon Fire Testing

Thermocouples were fitted to the webs and flanges of each of the I-section beams that had been blast tested and also to identical control test specimens that had not been blast tested. The control sections were coated with the same intumescent materials at a dry film thickness within 5% of the blast test specimens.

The blast tested and control specimens were then subjected to a fire test which simulated the heating conditions specified in Appendix D of BS 476: Part 20: 1987. This appendix relates to a temperature relationship, which simulates fires burning hydrocarbon fuels. The graphs in Figure 2 show the relationship between the specified hydrocarbon curve and the actual furnace temperature curve. In Figure 2 you can also see as an example the comparative average steel temperatures of one of the blast test sections with its equivalent control section. All the Firetex intumescents performed similarly in the hydrocarbon fire test. The example shown in Figure 2 relates to Firetex M78.

Thermocouples were fitted to the webs and flanges of each of the I-section beams that had been blast tested and also to identical control test specimens that had not been blast tested.

The steel temperature of the blast tested sample depicted in Figure 2 reached an average steel temperature of 550°C after 51 minutes and its equivalent control section after 53 minutes. It may therefore be considered that the influence of the gas explosion on the Firetex intumescent coating performance was negligible and did not prevent the coatings from providing a similar performance to that of the non-blast tested samples.

Hydrocarbon fires are generally much greater in severity than cellulosic fires.

It should also be noted that the performance of these materials, which were designed for use in cellulosic fires, was still significant. On the whole in the hydrocarbon fire tests the materials achieved in the region of 60% of their expected performance in a cellulosic fire. See Figure 3 showing Firetex M78 intumescent on a steel column during a fire test.

These fire tests were witnessed by an officer of Warrington Fire Research and are reported fully in Warres Report No. C128566.

Performance of Firetex M78 in a large-scale natural fire

This report is concerned with the performance of an intumescent coating (Firetex M78) to a steel column section during a severe natural fire

exposure. The performance in the natural fire is assessed against test data provided from a BS 476 Part 21 test on a similar section with a similar thickness of intumescent coating.

A 203 x 203 x 52 kg universal column section 1 m in length was protected was with an average intumescent coating thickness of 2.35 mm. The indicative column was tested alongside other coated sections and is shown in place inside the fire compartment in Figure 4.

An identical unprotected section is included for direct comparison. Thermocouples were located on the web and either flange at the mid-height of the sections.

Figure 4

The location of the fire compartment on the third floor of the steel building at Cardington is shown in Figure 5.

The figure also illustrates the severity of the fire during the post-flashover stage. The compartment floor area was 11 m by 7 m and the height of the compartment was approximately 4 m. Ventilation was provided from the window opening on the South face of the building. The original window height of 2.77 m was reduced to 1.27 m for the test to restrict the amount of oxygen available for combustion and therefore increase the duration of the fire. The compartment walls were built from plasterboard extending from the floor to a position approximately 500 mm from the underside of the ceiling. The gap between the top of the wall and the underside of the composite floor was sealed with compressible fibre to allow for the anticipated large deformations of the floor above.

The fire was designed according to the parametric approach provided in the latest draft of the fire part of the Eurocode (BS EN 1991-1-2:2002, Eurocode 1: Actions on structures). The fire load consisted of 40 kg of wood per square metre of floor area. This corresponds to a design fire load density of 720 MJ/m^2 spread evenly across the compartment floor. The predicted response compared to the measured temperature is based on an opening factor ($A_v\sqrt{h}/A_t$) of 0.043 m^{-1} and thermal properties of the compartment enclosure (b factor = $\sqrt{(\rho c \lambda)}$) = 714 J/m^{2}s$^{1/2}$K.

For a number of years the concept of time equivalence has been used to assess natural fire severity in terms of an equivalent period of exposure to a standard heating curve. The concept relates the maximum temperature achieved by a structural member in a natural fire to the time taken to reach the same temperature in a standard fire test. For protected steel sections this concept has been extensively validated and provides an indication of performance relative to a fire resistance period widely understood by designers and regulatory authorities. The time equivalence for this fire was calculated as 72 minutes. It was therefore considered appropriate to coat the steel column with a 90-minute fire protection thickness.

In this case the time equivalent value of the fire was closer to 100 minutes than the 72 minutes predicted. The unprotected section temperatures reached the so-called "critical" temperature less than 30 minutes while the average protected temperature remained below this value for almost the entire duration of the test and only ever reached a temperature 10°C above this value.

The results indicated that a steel member protected in a similar manner to the indicative test specimen with Firetex M78 would have maintained load-bearing capacity for the entire duration of the natural fire and for a period corresponding to an equivalent fire severity of approximately 100 minutes.

The results of this fire test are reported fully in BRE Report No. 211576.

Figure 5

Concluding Remarks

In conclusion the above series of tests using Firetex intumescent coatings has demonstrated that they will provide protection against explosion and hydrocarbon fire in addition to severe natural cellulosic fires.

The author hopes that this paper will go some way to provide additional confidence in expertly formulated intumescent coatings when they have been subjected to far more than the statutory requirements of BS 476: Part 21. IFP

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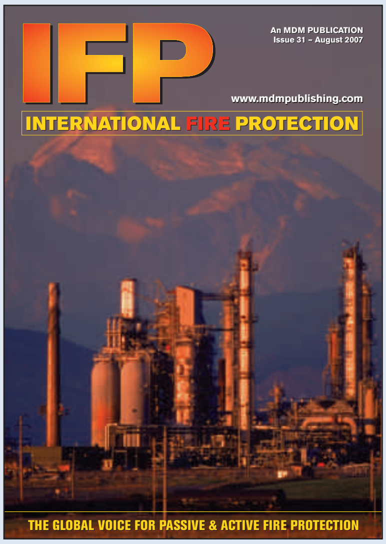

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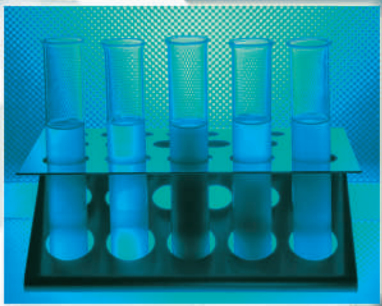

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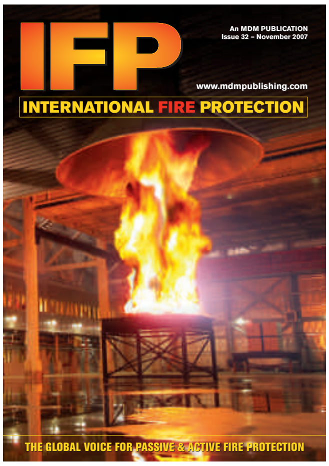

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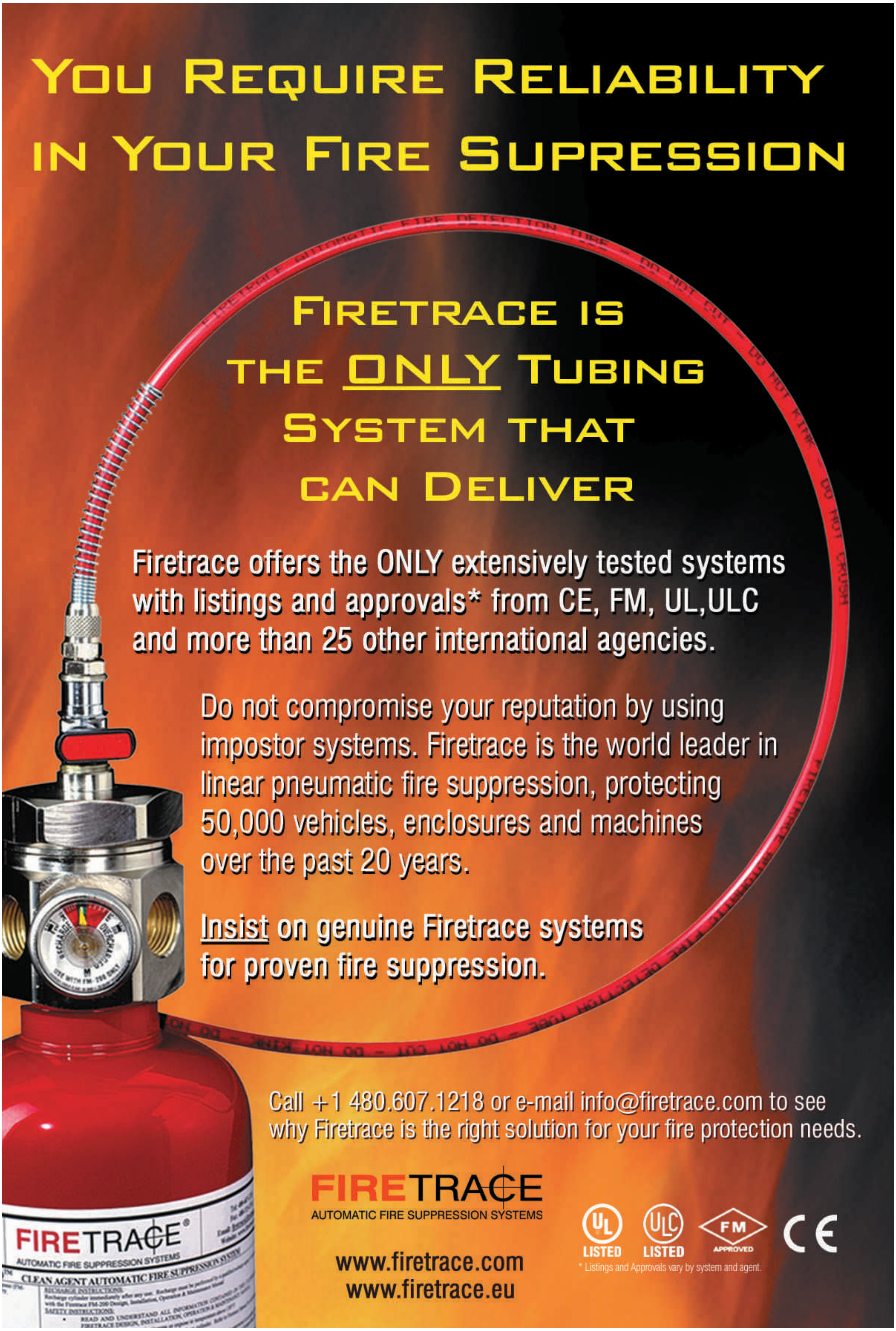

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Fire Alarm Voice Sounder Communicates with Extinguishant System

The Nexus Gas Extinguishant Voice Sounder from KLAXON SIGNALS is a fire alarm designed specifically to meet the requirements of gas extinguishant systems by supplying four stages of alarm, each with a separate and distinct fire warning message and tone.

This sounder comes complete with an interface unit that connects directly to the sounder and extinguishant panel. The interface unit monitors the outputs from the panel and sends out the appropriate message and tone via the sounder. A choice of up to 7 messages can be stored in the sounder and each message is preceded by a dedicated user selectable tone and/or flashing LED beacon. The combination of a clear voice message, powerful sounder and high efficiency LED beacon ensures a very effective warning tool.

All Nexus voice sounders have a USB interface that allows special messages in WAV format to be downloaded onto the sounder from any PC, providing users with the flexibility of adding/removing messages in-house.

They have a high 110 dB output, are weatherproofed to IP66 and can be installed in almost any location. A choice of sound outputs means there is a model to overcome most levels of background noise.

Klaxon Signals Limited is one of the world's leading manufacturers and suppliers of sound and vision signalling equipment for fire and life safety, industrial and security applications. Part of Halma p.l.c., Klaxon offers an extensive range of fire alarm sirens, electronic sounders, buzzers, beacons and bells, in addition to innovative evacuation technology and software.

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Royal Protection Commander joins new Kingfell team

Dai Seaborn Davies, who until 1996 was Operational Commander in charge of royal family protection, has joined KINGFELL GLOBAL CRISIS LIMITED, the latest division of fire, risk and crisis control specialist, Kingfell Plc. His associate status will see him work closely alongside Kingfell CEO, Paul Bryant, as well as Geoff Williams, who is heading-up the new division, and Colin Simpson, another crisis management specialist.

His appointment, according to Paul Bryant, is seen as being of strategic importance to the business, which is already attracting considerable international interest. He said: "It is hard to think of another time, other than when the country has been at war, when security was of such paramount importance. Security is a vital consideration in any discussion on crisis management, and an indispensable part of every business continuity plan. We are fortunate to have attracted to Kingfell someone with Dai's 30 years specialist front-line operational experience and reputation."

During the time he was responsible for the security of the royal family and palaces, Dai led a force of 450 police officers, with an annual budget of £26 million. He is widely regarded for restructuring and reorganising key aspects of the royal family and palace protection regimes, having introduced a number of significant personnel, selection procedure and training changes, and completely overhauling the intelligence-led personnel, VIP and static protection protocols.

Since his retirement from the Metropolitan Police, Dai has built an international reputation as an investigator and global security adviser, and regularly contributes to television coverage and analysis on security matters and VIP protection. His particular areas of expertise today encompass crisis management and corporate security. He is a much sought after speaker on security generally and an acknowledged expert on ship and port security.

A detailed overview of the divisional structure Kingfell Plc, along with contact details of the key executives, can be found on the company's recently enhanced website at www.kingfell.com.

The company can be reached by telephone on +44 (0)845 60 61 999, by fax on +44 (0)845 25 81 999, or via email at enquiries@kingfell.com

Fire-Cryer® Voice Sounders Top the North

The tallest building in the North, Bridgewater Place, Leeds, has installed over 300 Mini Fire-Cryer® Voice Sounders from VIMPEX LTD. Bridgewater Place is the premier business premises in Northern England comprising of over 23,000 sq. ft. of office space located side-by-side with 200 high-rise apartments, retail outlets and leisure facilities in a prestigious development.

The Mini Fire-Cryer® multi-message voice sounders have been installed in all office accommodation at the new site, providing building-wide voice evacuation in the event of a fire. Vimpex's clients; ADT Fire and Security chose the Mini Fire-Cryer® for the product's clarity of voice and the ease of installation.

Bridgewater Place, Leeds

The Mini Fire-Cryer® is a slimline base sounder, which meant that it was very easy to install, fitting discreetly beneath the ADT detector bases and creating an overall detector/voice sounder combination with a very low profile – important in a building with such prestige.

The Fire-Cryer® system incorporates special software which allows a normal sounder circuit to broadcast up to 7 separate user-defined messages along a single pair of wires. When interfaced to an analogue fire loop via sounder controllers, the Fire-Cryer® circuit is able to differentiate between alert and evacuate inputs. This means that with no user input, the building can safely be evacuated via a two stage alarm.

The mini Fire-Cryer® is just one member of the extensive Fire-Cryer® family which includes the new Fire-Cryer® Plus combination voice/strobe and the Maxi Fire-Cryer®, which is able to broadcast 7 messages at 116dBA volume.

For more information: www.vimpex.co.uk

New RCP 6B Radio Fire System

A Wire-Free alternative to Conventional Panels from detectomat

The New Wire-Free, Radio Fire System from DETECTOMAT is a unique alternative to the costs, potential damage and business disruption associated with installing Fire Systems in existing buildings. And an ideal solution for retrofit and refurbishment applications in small to medium sized enterprises.

Interconnection of the various Fire System components including detectors, manual call points, sounders and control panels, which has traditionally been done in electrical cabling can now be done with wire-free radio. Installing cables in existing buildings has, in the past, meant ugly surface wiring or damage to decorations caused by the installation of concealed wiring. Installing concealed wiring is also time consuming and presents access issues and general disruption to ongoing business. This all meant an unwanted and unnecessary escalatation of costs, which can now be avoided!

Radio as a Fire System communication medium has been available for many years but at a high cost. Now, the unique RCP 6B system from detectomat offers a cost-effective wire-free, Radio Fire Alarm solution as an alternative to hardwired Conventional and smaller Addressable applications. And as an added benefit the system utilises detectomat's unique range of Designer cover Smoke Alarms to complement traditional or modern contemporary interior designs.

The system comprises of a range of battery operated, self-contained fire detection and alarm devices including Heat and third party certified Smoke Alarms plus Manual Call Points, Sounder Beacons and other fire peripherials. These devices are radio connected with each other via a Fire Panel base station, which provides comprehensive alarm indication and control including monitoring of the system network integrity and battery conditions.

A unique solution within its application area, which has been reviewed and well received by a number of Fire Service and Fire industry professionals.

For further information call 01579 321750, or visit www.detectomat.com

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FIRE PRODUCT SEARCH, the next generation of product guide, has proved a huge success since launching earlier this year. Based on actual fire products, the Fire Product Search website allows users to make an informed choice when specify fire equipment by providing up to date detailed information.

Fire Product Search features hundreds of the world's leading fire equipment manufacturers giving users a huge choice when searching for fire products. Updated constantly it provides reliable information at the click of a button.

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Draka unveils new high-performance cables

Derby-based cable manufacturer, Draka, has launched two new cables. Saffire is a new generation of OHLS – Zero Halogen Low Smoke – cable that is claimed to set a new and higher level of fire safety performance, while Firetuf Powerplus is a new 600/1000V SWA (Steel Wired Armoured) power cable that provides enhanced circuit integrity performance to meet the demanding requirements of BS 7346-6:2005.

Firetuf Powerplus 600/1000V SWA (Steel Wired Armoured) power cable

Both complement the company's award-winning Firetuf range of performance cables that today embraces low voltage (cables up to 1kV) building wires and power cables that are available throughout the UK, Ireland and the Middle East.

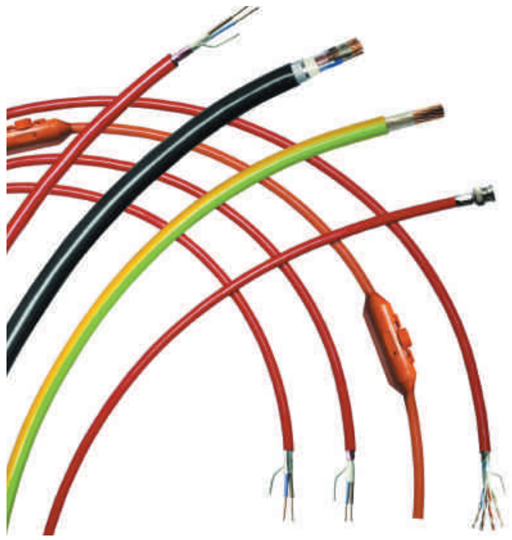
Saffire will, the company says, enable consultants to specify cable that provides enhanced safety in line with the latest fire safety legislation, and greatly assist building control officers to easily identify that superior fire safety is being incorporated into a building. Saffire will also provide contractors with a new bench-mark brand for third-party approved fire safety cabling.

The new cable extends the safety benefits of OHLS cables to a much wider marketplace. OHLS cables do not emit halogen gases and burn without producing large amounts of dense smoke. By comparison, under fire conditions, the standard PVC cables used widely in the construction industry emit hydrogen chloride gas, which has a suffocating odour that is detectable in even very low concentrations. Burning PVC cables also generate hazardous volumes of debilitating or disorientating smoke that can easily increase the likelihood of panic and make safe evacuation much more difficult to achieve.

The new Firetuf Powerplus cable utilises high-performance materials to achieve the maximum 120-minute rating when subjected to integrated testing involving flame irradiation exposure, direct impact and high-pressure water spray. It has been introduced to provide the superior performance characteristics required by today's sophisticated fire engineering solutions. These are becoming increasingly commonplace, particularly in the UK following the introduction of the Regulatory Reform (Fire Safety) Order 2005, and the more widespread utilisation of fire engineering principles and techniques that call for greater reliance on complex life and property protection systems and protocols.

Enhanced circuit integrity of the new Firetuf Powerplus preserves the handling and installation characteristics of the wire armoured design. It is a development of Draka's Firetuf Power cable that was introduced to meet the requirements of BS 7846:2000.

In the UK, the Department of Communities and Local Government's Approved Document B (Fire safety) 2006 of the Building Regulations came into force on 6 April 2007 and will have a major bearing on future building work in England and Wales. This Document specifies fire performance in accordance with BS 7346, and will impact on fire safety systems including: automatic fire suppression installations; fire detection and alarm systems; fire compartmentation; smoke control and ventilation; sprinklers and wet risers; ventilation and shutters; and firefighting lifts. Significantly, all these systems require a secure power supply that will retain its integrity in the event of fire, which highlights the imperative need for enhanced performance power cables.



Saffire Zero Halogen Low Smoke cable

The details of the flame irradiation exposure, direct impact and high pressure water spray tests successfully completed by Firetuf Powerplus are currently documented in Annex B of BS 7346. However, they will soon be published as a stand-alone standard, BS 8491. The BS 7346-6:2005 standard defines the fire performance requirements of various types of fire-rated cables for maintaining circuit integrity for people – which includes fire and rescue personnel as well as building occupants – property and the environment.

Details on both cables can be found on the Draka UK website at www.drakauk.com IFP

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PROFILE

Sinteso F20 – complete detection for any application

Sinteso F20 is a complete fire detection system from Siemens Building Technologies (SBT). Previously available only through the Solutions side of the Siemens business, Sinteso is now being rolled out to companies in the Siemens Solutions Partner programme, a scheme whereby fire detection providers throughout the world are trained and certified by Siemens.

In developing Sinteso F20, SBT has recognised that in terms of fire protection, intelligent system technology is no longer merely an interaction between smoke detectors and the fire control panel. Sinteso FS20 not only offers the highest detection reliability but can be integrated, expanded or adapted to changing building utilization with ease.

Uniform Technology – Flexible Networking

Sinteso F20 is the new control panel family, building on the success of the Sinteso fire detection range of products. Over half a million Sinteso detectors are currently integrated into systems all over the world, where they guarantee correct and reliable operation everyday.

The system is based on a uniform technology platform that lays the foundations for the various system components such as sensors, control panels, communication networks and alarm devices to work together in a smooth and co-ordinated manner as a total solution. As well as its complete functional reliability, Sinteso F20 offers significant advantages in the event of changes in building or room use, or when extensions are added to buildings. The modular structure and the use of standardized interfaces (e.g. Ethernet, BACnet) means that the system can be flexibly networked and adapted or expanded in response to changing customer requirements without any major complications. Sinteso FS20 has moved away from a centralized system architecture to one that relies on smaller, decentralized units, thereby ensuring that building owners can always be sure that more than enough expansion capability exists to meet any eventuality. This has been achieved without the increased effort often associated with decentralized systems – Sinteso requires only a single access point for commissioning and maintenance. It is also possible to network a panel with a remote control panel via Ethernet.

Network-Optimized Control Panels

The new range of control panels enables SBT to cover all application segments with a uniform technological platform. For example, this ranges from the control panel for stand-alone applications with the possibility of two loops and a maximum of 252 field devices (sensors, alarm transmitters, etc.) through to a large-scale system with 30 loops and a maximum of 3000 field devices. The field devices are connected via the specially developed FDnet Furthermore, FDnet carries the power to the field devices, a factor that is reflected in reduced energy. Cabling costs are also less since additional cabling is no longer required to ensure transmission in the event of a processor failure. Several control panels are networked together using the high-performance FCnet control panel bus (Fire Control network). The newly developed control panel bus guarantees high-speed, efficient data transfer and makes it possible to configure the network topology largely without limitations (with copper and/or fiber optic conductors). The compact and modular design of the Sinteso range of control panels allows easy systems extensions or adjustments. The operating displays are standardized for all control panels and are configured to make them clearly comprehensible. All functions comply with the relevant standards (EN54) and can be carried out intuitively for all events.

Detectors – Guaranteed Reliability

In 2004 SBT introduced the new Sinteso detectors. These sensors carry the quality seal of ASA Technology (Advanced Signal Analysis) and achieve unparalleled levels of detection reliability – false alarms due to simulated fires are practically impossible. The detectors guarantee a reliable response to almost all types of fire, even under the most difficult ambient conditions. Siemens is so confident of detection reliability that they will pay for the cost of a fire brigade call-out if this is caused inadvertently by a false alarm, when installed by Siemens. Sinteso detectors are compatible with older Siemens conventional fire detection systems and can be migrated to existing networks to a large extent.

Proven Expertise

The reliability and efficiency with which a fire detection system performs its tasks is largely influenced by the fire control panel. The new Sinteso control panels thus set a technological milestone and also offer advantages in other areas, such as networking capabilities. The panels, coupled with the detectors and a wide range of peripherals, guarantees trouble-free and financially efficient operation in a technology that is based on decades of Siemens expertise in minimizing damage to people and assets. IFP

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C-TEC launch new automatic extinguisher panel

C-TEC has launched a three zone automatic extinguisher panel specifically designed for areas housing expensive, dangerous or irreplaceable items of equipment such as computer servers, chemicals or antiques.

With the growing emphasis on safeguarding not only people but property and society's increasing reliance on computerised systems, the market for such panels is booming. Computers and electronic equipment are particularly susceptible to fire and heat, and, therefore, need to be protected by special equipment. C-TEC's new EP203 releases a fire suppressant gas to extinguish the fire with minimum damage to the equipment housed within the protected area.

Fully compliant with EN12094 part 1 (the European standard for Fixed Firefighting Systems – Components for Gas Extinguishing Systems), our new EP203 panel has been manufactured to the highest standards and epitomises quality, durability and reliability.

The panel functions as a standard three-zone conventional fire alarm panel but has additional, highly sophisticated extinguishant release circuitry for controlling the release of fire-suppressing gas into computer rooms, chemical plants, museums, etc., where fires need to be put out quickly and with minimal damage to the protected equipment.

Any combination of activated detector zones can be programmed to automatically start the panel's extinguishant release sequence which can be set to operate with or without a delay. And with no less than six monitored inputs, including Hold and Abort for suspending or cancelling the release sequence at any time, the EP203 looks set to become one of the most popular extinguisher panels on the market (see the schematic for a visual overview of the panel's many inputs and outputs).

Says C-TEC's MD, Andrew Foster, 'The company's new state-of-the-art Research and Development facility and recruitment of additional specialist engineering staff has made the development of this new auto-extinguishant panel possible. This product has been designed to meet demand from our customers for a top quality auto-extinguishant panel and we confidently expect the ECP to exceed all expectations'.

The panel is supplied in an elegantly-styled, durable enclosure with all of its electronics – apart from its powerful 3A EN54 switch mode PSU – mounted on a detachable metal bridge plate for ease of installation.

In addition to a manual extinguisher release switch, the enclosure's front also features a 128 x 64 pixel graphical display, giving users a constant overview of the system's status, and a keyswitch allowing authorised users to toggle between automatic and manual mode. For additional flexibility, up to eight remote status units, each with their own LCDs, manual release and mode switches, can be connected to the panel via a monitored RS485 network. Economy status units are also available.

Other key features include three monitored sounder circuits (two x 1st stage; one x 2nd stage), adjustable flood times, an alarm counter, a time-stamped log and volt-free changeover relay contacts for fire, local fire, 1st stage active, 2nd stage active, extract fan and fault.

An optional relay expansion board is also available with reset, mode, discharged, hold and abort outputs. IFP

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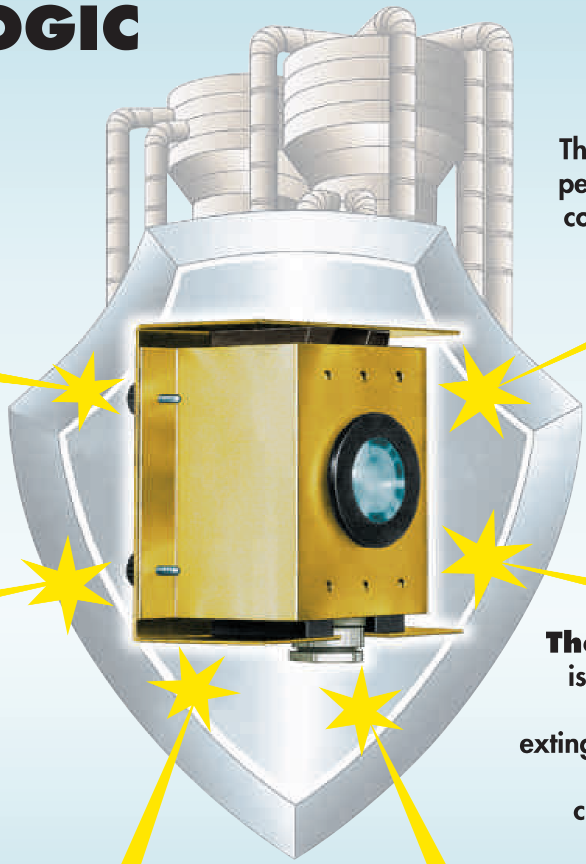
CONTROL LOGIC Spark detector

Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds



designed for dust collection systems to protect storage silos from the risk of fire.

The CONTROL LOGIC SPARK DETECTOR
is faster than the sparks themselves.
It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash.
It needs no periodic inspection.

The CONTROL LOGIC system
is designed for "total supervision".
It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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E-mail: controllogic@controllogic.it - Web: www.controllogic.it

CONTROL LOGIC s.r.l.

BETTER *TO KNOW* IT BEFORE

Eye is faster than nose.
In the event of live fire
the IR FLAME DETECTOR
responds immediately

CONTROL LOGIC
IR FLAME DETECTOR
the fastest and most effective fire alarm device
for industrial applications

IR FLAME DETECTOR
RIV-601/FA
EXPLOSIONPROOF
ENCLOSURE

For industrial applications indoors or outdoors where is a risk of explosion and where the explosionproof protection is required.
One detector can monitor a vast area and responds immediately to the fire, yet of small size.

Also for
RS485 two-wire serial line

IR FLAME DETECTOR
RIV-601/F
WATERTIGHT
IP 65 ENCLOSURE

For industrial applications indoors or outdoors where fire can spread out rapidly due to the presence of highly inflammable materials, and where vast premises need an optical detector with a great sensitivity and large field of view.

ISO 9001

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CONTROL LOGIC s.r.l.

NEW IEC Standard on fire pump controllers

By Richard (Dick) Schneider, P.E.

A new IEC standard for electric and diesel driven fire pump controllers was Approved by world vote on 12 January, 2007. The project was started by IEC S/C 17B, WG2 during its meeting in Jakarta, Indonesia in 1996.

The Introduction of the document perhaps best describes its purpose which is as follows:

"IEC 62091 pertains to life-safety equipment and is based in part on NFPA 20 (1996) STANDARD FOR THE INSTALLATION OF CENTRIFUGAL FIRE PUMPS. When called upon to work by automatic signal, manual-electric signal or manual-emergency actuation, the controller is expected to start the pump driver (motor or diesel engine) because "the building is on fire". Failure to carry out its task will increase fire damage to the building, its contents and people therein. These controllers default to a RUN state. They are intended to be located in compliance with local requirements which generally will place them in pump rooms or pump houses that have some specified degree of fire protection. These locations often have sweating overhead pipes, are possibly sprinklered and are in the vicinity of vaults housing other building distribution equipment."

Presently, some requirements for fire pump controllers are included in various installation standards for fire protection equipment that vary among countries, regions and jurisdictions. These variations are based on different cultures, different practices, different cost/benefit concepts and some are mutually exclusive.

Citizens expect that buildings accessible to the general public are safe. In recognition of those expectations, fire protection and suppression equipment must reliably and automatically respond and, in the case of equipment or power supply anomalies, must be capable of being placed back in service in a minimum time. IEC 62091 mandates that fire pump controllers deviate from other controllers built to industrial motor control standards by specifying locked rotor protection instead of overload protection and introducing the concept of "sacrificial conductors and equipment" in favor of getting a distressed pump going. Restoration from short circuit and locked rotor protection must be designed to a) afford minimum "down-time", b) be unaffected by ambient conditions, c) permit non-electrically qualified people to re-establish power availability, d) not require the replacement of electrical parts and e) not require analysis, electrical test equipment and specialized training that detract from the principle of minimizing out-of-service time under distressed conditions.

Premises burn the same regardless of location on this planet and surely there is one best way to suppress fires. IEC 62091 is written in performance language and thus offers maximum design freedom to attain that performance and reliability. Local, regional or national standards should now be re-assessed to have requirements for fire pump controllers harmonized with IEC 62091.

The IEC has as its mission to be globally recognized as the leading provider of standards, conformity assessment schemes and related service that are needed to facilitate international trade and enhance user value in the fields of electricity, electronics and associated technologies.

LETTER

Dear David,

Reference is made to David Carter's article in the August 2007 edition of IFP Magazine entitled Fire Pump Controllers.

In the interest of minimizing "down-time", most standards other than EN 12845 require the use of circuit breakers rather than fuses in the fire pump controller. Firemen dispatched to the pump room to investigate a distressed fire pump controller during a fire do not have the time, electrical diagnostic instruments, tools nor necessarily spare fuses to readily get the pump going. It is

suggested that the EU adopt IEC 62091 rather than EN 12845 to minimize the loss of fire protection under fire conditions.

Thank you,
R. Schneider, P.E.
Lancaster, S.C

Fibrolaser: linear heat detection for industrial and tunnel applications

SIEMENS BUILDING TECHNOLOGIES (SBT) offers a fire detection technology specifically designed to meet the demanding requirements of industrial and road tunnel applications. As a linear heat detection system, it is being widely employed in fire prevention within cable tray, conveyer belt, laboratory applications and beyond.

Although markedly different in their nature, cable trays and road tunnels both demand quick detection and localization of the fire source, minimizing the time until the fire alarm is confirmed. This is the role of FibroLaser, a linear based fire detection system that can cover the entire fire protection process, from detection to transmission of the information to the fire service, all from one source.

FibroLaser was originally tested in the Swiss test tunnel Hagerbach, providing an ideal environment for research, development, practical tests and optimization of the product. Since then, over 1500 kilometers of FibroLaser have been installed in tunnels throughout the world, as well as in halls, parking garages, conveyor belts and cable trays as its linear detection capabilities were explored and utilized in other markets.

FibroLaser offers security over an entire installation (detecting up to 4 km in length) and meets all the latest linear fire detection standards. It is sensitive to both convection and radiation heat, ensuring it detects fires not only extremely quickly but also with precise location and with the maximum security against error and false alarms. Once a fire is detected, exact information regarding its size, location and direction is transmitted over a standard interface to the alarm and operating systems.

FibroLaser is also designed to operate under harsh conditions, able to withstand the rigors of damp, corrosive, fast arising heat or strong wind situations. It is also unaffected by electromagnetic interference which can occur in cable trays or train tunnels.

For more information:
www.siemens.com/buildingtechnologies

The New Generation of Fire Sentry Flame Detectors

Fire Sentry Corporation is pleased to announce the introduction of a new generation of Multi-Spectrum radiant energy IR fire and flame FSX detectors including the new FS24X QuadBand Triple IR and FS18X TriBand Dual IR detectors. The new detectors were designed utilizing Fire Sentry's patented WideBand IR™ technology.

FS24X QuadBand Triple IR detector

In the past most critiques of optical flame detectors and those claiming to know about these devices have typically lumped all Infrared and Triple IR flame detectors in one category: narrow band IR technology using the 4.3 micron emission spike generated by hot CO_2 and one or two adjacent narrow "guard" bands to reduce false alarms. There is, however; another type of infrared optical flame detection technology, namely Fire Sentry Corporation's patented WideBand IR™ technology. Fire Sentry Corporation pioneered the use of quantum sensor WideBand IR™ technology back in 1988 with the introduction of the Model SS2 UV/IR flame detectors and thereafter in 1994 with the highly successful Model SS4 UV/IR flame detector.

There are inherent advantages of WideBand IR™ technology and disadvantages of Narrow Band 4.3 micron technology explained as follows:

1 Fire Sentry Corporation's new FSX detectors utilize an array of high-speed photoconductive quantum sensors that directly measure magnitude and dynamic signal amplitude of the incident photon energy generated by fires. Conventional narrow band Dual (IR2) and Triple IR (IR3) flame detectors, on the other hand, use pyroelectric or thermopile sensors with interference filters that respond only to emission of narrow band 4.3 micron hot CO_2 or 2.8 micron hot H_2O as indirect measurements of a fires' radiant energy.

2 The new FSX fire and flame detectors using WideBand IR™ technology are designed to alarm to all types of hydrocarbon and non-hydrocarbon (i.e., hydrogen, silane, metal fires, etc.) based fires in a single detector. Other conventional fire detectors using the narrow band IR technology must use two separate detectors for complete coverage of hydrocarbon and non-hydrocarbon fires which result in added cost and system complexity.

3 The FSX detectors using WideBand IR™ technology are NOT blinded by water, ice, snow, rain, fog, smoke, or moisture condensate on the detector's lens. However, a thin film of moisture on any of the sensor lens of conventional detectors relying on the narrow band 4.3 micron technology will make the detector ineffective in detecting fires. Additionally, ice, snow, fog, or smoke in the detector's optical detection path also can render these detectors ineffective in detecting fires.

4 In the FSX detectors an integral heater is used primarily to protect the electronics from exposure to extreme cold temperature rather than keeping the detector lens free of moisture. With the conventional IR detector an integral high power heater is a must to keep the detector lens clear of moisture at all times and to ensure stable operation of the Narrow Band interference filters.

FS18X TriBand Dual IR detector

5 The FSX detectors with Multi-Spectrum WideBand IR™ technology exhibit wider field-of-view (110 degrees) and significantly higher operating temperature (+85°C) than competitive IR detectors using narrow band thermal pyroelectric or thermopile sensors.

One of the most unique and significant features of the Multi-Spectrum WideBand IR™ based technology with Fire Sentry's FirePic™, SnapShot™, and PC Windows diagnostic software is the intrinsic flexibility that permits Fire Sentry engineering to adjust detector software parameters to optimize detection to almost any type of fire for unique applications. This capability is not available with conventional IR detectors relying solely on detecting the emission of hot CO_2 generated by hydrocarbon or hot H_2O generated by non-hydrocarbon based fires.

Fire Sentry Corporation has a long tradition in utilizing superior and innovative technology with the creation, design, development, testing, and manufacturing of all its fire detection products. These detectors are designed to provide the fastest response to all types of hydrocarbon and non-hydrocarbon fires without false alarms over the widest field-of-view in all environmental conditions and scenarios.

Fire Sentry Corporation has been the technological leader in electro-optical fire and flame detection since its beginning over a quarter of a century ago and continues to capitalize on the military/aerospace electro-optical detection background of its engineers. Our tens of thousands of installed fire detection products continue to perform as advertised in a myriad of applications worldwide. For additional information, please go to **www.firesentry.com**. IFP

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Bringing Meaning to Sound

Fire Alarm technology has come a long way since the introduction of the electric Fire Bell in 1860. With the introduction of electronic sounders in the late 70s, the popularity of the fire bell began to decline. The electronic sounders were able to produce a range of sound outputs and consume much less power than their older, less flexible counterpart.

Sonos twist and click voice sounder

Although electronic sounders are able to effectively address most problems in the event of a fire, the alarm can still create confusion due to the absence of a common warning signal and lack of communicated information. To add to this problem manufacturers are offering electronic sounders with a number of tones to satisfy mass markets. Unlimited tone choice coupled with the absence of a common warning tone means that there will rarely be a consistent warning signal from one site to the next, leaving room for ambiguity to set in.

Ambiguity leads to a delayed action and longer response time. Therefore the need for a clear unambiguous voice message to accompany a warning tone and combat confusion or complacency during an active alarm led to the development of the voice sounder.

In general, warning tones alert the public of some form of danger and expect them to make a decision on how best to respond and take action. In unfamiliar surroundings this response tends to vary amongst individuals causing panic and distress for everyone on site. Voice sounders can address this issue by giving out clear concise instructions on the exact course of action to be taken following an emergency signal.

Klaxon Signals has expanded its Sonos and Nexus Range of fire alarms to include new voice enhanced variants – where normal sounder signals are combined with a clear, synchronised voice message to help reduce confusion and distress during an active alarm.

Sonos Voice

The Sonos Voice Sounder is an entry level device designed to broadcast a single evacuation message in small to medium fire alarm installations. This message is preceded by a selectable fire alarm tone for clear, effective warning.

Sonos Multi Message Voice Sounders are available for larger installations where both, 'Alert' and 'Evacuate' messages are required for staged evacuation. Up to four messages can be transmitted over two wires via an interface unit which monitors the sounder circuit outputs from the fire alarm panel. A test facility is available through a key switch mounted on the interface unit which emits an 'All Clear' message when the key switch is returned to its original position.

Both the single message and multi message Sonos units benefit from all the features of the existing range.

Nexus voice sounder with LED beacon

Nexus Voice

The standard Nexus voice sounders are available with 4 pre-programmed messages, selected from an extensive message library covering almost any conceivable application. Bespoke messages are also available on request.

The Nexus Gas Extinguishing Voice Sounder has been designed specifically to meet the requirements of gas extinguishing systems by supplying four stages of alarm each with a separate and distinct warning message and tone.

All Nexus Voice sounders have a USB interface that allows special messages in WAV format to be downloaded onto the sounder from any PC, providing users with the flexibility of adding/removing messages in-house.

They have a high 110 dB output, are weatherproofed to IP66 and can be installed in almost any location. Either xenon or high efficiency LED beacons can be added to the Nexus sounder. The combination of a clear voice message, powerful sounder and high output beacon ensures a very effective warning tool.

Voice sounders are effective at reducing response time to an alarm signal by providing essential information about the type of alarm and the action required by those in the area. Having an understandable message in addition to a warning signal prevents confusion and provides the impetus for people to take action rather than waiting for confirmation. IFP

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Skum™ protection for high risk environments

Providing the right combination of firefighting agent and delivery system has led to the TYCO SKUM™ brand being recognised globally as the industry's leading provider of dependable and efficient

firefighting solutions for high value, high risk petrochemical, aviation, marine and power plant applications. SKUM designs and manufactures sophisticated foam-based extinguishing systems and equipment to safeguard installations where a fire has the potential to have catastrophic economic, environmental or life-threatening consequences. In addition to developing innovative solutions, such as the SKUM HOTFOAM™ high-expansion foam system that is designed for use in enclosed spaces, the brand is also at the leading edge when it comes to foam delivery systems and engineering.

The SKUM brand's sophisticated fixed or mobile delivery systems do away with the need for the massive and urgent deployment of equipment and firefighting personnel. They also ensure that a fire is responded to in the shortest possible time, so reducing the potential for the fire to develop into a major incident. SKUM was first to develop a semi-subsurface system for storage tank protection and this, and other SKUM systems, are today in use throughout the world providing around-the-clock protection for oil, LNG and other flammable liquid storage tanks and bunds.

The SKUM offering also includes an array of fixed foam generators and fixed monitors that can cost-effectively protect storage tanks and associated spill or ground fires. The current line-up also encompasses portable monitors and trailers that can be quickly and easily deployed. These are used extensively by municipal and industrial fire brigades and professional firefighters.

SKUM monitors are noted for such characteristics as long throw capability and fast knock down. Many, such as the latest FJM-EL ranges of electric remote control of monitors, incorporate features not readily found on other systems on the market, and use materials that are more resistant to the corrosion found in marine or harsh industrial environments. Several of the SKUM water or foam monitors are less than half the weight of some competitors' comparable models.

Further details on SKUM – Skum is the Swedish word for foam, which is pronounced "skoom" – solutions and expertise can be found at www.skum.com, or are obtainable by email on tspmarketing.emea@tycoint.com, by telephone on +46 303 57700, or by fax on +46 303 58200.

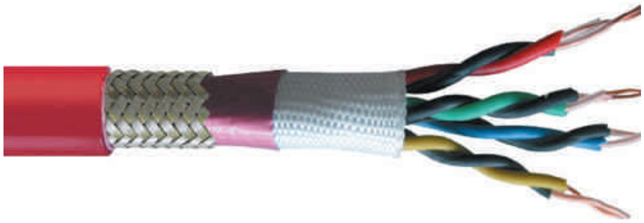
Draka's Firetuf cable offering expands to meet industry's needs

DRAKA has announced a number of landmark contract wins for the latest additions to its Firetuf range of OHLS [Zero Halogen, Low Smoke] fire performance cables. Major successes have been notched up for Firetuf Easystrip, Firetuf Connecta, Firetufplus and Firetuf EMC. These have included Europe's current largest construction project, Heathrow Airport's new Terminal Five; the new £360 million Diamond Light Source high-technology scientific research facility in Oxfordshire; the new Dublin Port Tunnel in Ireland; the Bakerloo, Central and Victoria lines for London Underground; and the O2 arena in Greenwich. One of the latest additions to the Firetuf range is Firetuf Easystrip, so called because tests have shown that it is the easiest cable of its type on the market to dress and offers the quickest sheath removal, ensuring that it has the fastest termination time. Firetuf Connecta can be supplied in customer-specified lengths, incorporating factory-fitted moulded sockets that eliminate the need for on-site joint forming.

Firetuf Easystrip offers superior resistance to kinking, making it almost impossible to damage during installation. This is because Firetuf Easystrip has what is called a "filled" sheath that supports the insulated twisted cores during installation flexing, and provides significant additional protection during a fire. Draka claims that Firetuf Easystrip is the lightest and smallest diameter cable of its type on the market, capable of the smallest bending radius without deforming the cable. Its use has recently been approved by Tube Lines, which maintains 100 London Underground stations.

Firetuf Connecta is a fast-track solution that has a significant and positive impact on installation time. Quick-fit secondary outlets can be taken from the Connecta sockets to individual pre-installed fittings, and the cable maintains the integrity of the circuit even if a local device fails in the event of a fire. This ensures that escape routes either side of a failed luminaire, for example, remain illuminated rather than plunging those in the vicinity into panic-inducing darkness.

Firetufplus enhanced cable offers superior pliability, robustness and flame retardancy, and provides 60 minutes fire and mechanical protection, followed by 60 minutes of fire, mechanical impact and water protection. This



exceeds the requirements of BS 5839 Clause 26.2e.

Firetuf EMC is a Standard grade cable that shares many of these premium-build specification features, and is particularly appropriate for airport environments where higher than normal levels of electro-magnetic radiation are present, rendering fire detection and alarm systems vulnerable to false alarms.

The latest addition to the Firetuf cable offering is Firetuf Powerplus, a new armoured power cable that provides enhanced circuit integrity performance to meet the demanding requirements of BS 7346-6:2005. Firetuf Powerplus utilises high-performance materials to achieve the maximum 120 minute rating when subjected to integrated testing involving flame irradiation exposure, direct impact and high-pressure water spray.

Derby-based Draka UK is the country's leading designer and manufacturer of fire performance cables, zero halogen power cables and building wires. The company is part of Netherlands-based Draka Holdings NV, which has over 9,000 employees worldwide.

Full details on Firetuf and other Draka products are available by telephone on +44 (0) 1332 345431, by fax on +44 (0) 1332 331237, and via email at firetuf@draka.com. The company's website can be found at www.drakauk.com

DuPont™ FE Clean Agent Fire Extinguishants

Safe, environmentally sustainable fire suppression solutions

The DuPont Company manufactures and markets HFC clean agent fire extinguishants that are designed to knock out a building fire before the fire gets out of control, and before the sprinkler system is activated. Once the sprinkler system is activated, the damage that is done can be devastating to both people and business assets, and to the long-term sustainability of the business in general.

DuPont clean agent fire extinguishants that are available include:

FE-227™ – a fire extinguishing replacement for Halon 1301 in total flooding applications. Known as heptafluoropropane or HFC-227 ea, DuPont™ FE-227™ is the most widely used clean agent replacement for Halon 1301 globally.

FE-25™ – Offers the easiest, most cost-effective option to retrofit an existing system. DuPont™ FE-25™ is an excellent choice for total flood suppression systems where water, dry chemicals or carbon dioxide can cause collateral damage to irreplaceable assets.

FE-36™ – Is suitable for portable fire extinguishers and is an excellent option to protect high-value property that can be found in applications such as computer rooms, telecommunications facilities, process control rooms, museums, archives, marinas, hospitals, banks, laboratories, airplanes and motorsports.

FE-13™ – Is a clean agent replacement for Halon 1301 that can be used in areas that are normally occupied by people. DuPont™ FE-13™ is the preferred alternative where its low toxicity provides for improved safety margins, the protected spaces are large, or where the temperatures are likely to go below 0°C (32°F).

Environmental impact of HFCs

There are a number of misconceptions surrounding the environmental impact of hydrofluorocarbons (HFCs) in clean agent fire suppression materials. None of the current key global regulatory initiatives place restrictions on the use of HFCs in fire protection due to the low emission levels of these applications.

In fact, the leading HFC clean agent fire suppression materials found in DuPont™ FE clean agent fire extinguishants, provide an environmentally sustainable fire protection solution that is fast, effective and non-ozone depleting.

Contributions to green building credits

The U.S. Green Building Council (USGBC), a nonprofit coalition of building industry leaders, developed the LEED® system to establish a common standard of measurement for environmentally sustainable building practices. DuPont Fire Extinguishants help contribute

to LEED® credits in the Energy & Atmosphere category. The Ozone Protection section requires that projects "do not operate fire suppression systems that contain chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) or halons" in order to merit certification. Specifying DuPont™ FE clean agent fire extinguishants, which have zero ozone depletion potential and are preferred alternatives to halon, fulfills this requirement. And, many countries in the international community have adopted green building standards similar to those developed by the USGBC.

Conclusion

HFCs are well-established as reliable and highly effective clean agent fire extinguishants. They have zero ozone-depleting potential, and voluntary codes of practice within the industry have significantly reduced emissions levels by clearly stating responsible methods of installing, retrofitting, maintaining and servicing fire suppression systems.

Due to the low emissions levels across the industry, none of the key environmental regulatory initiatives restrict the use of HFCs in fire suppression applications. In fact, specifying DuPont™ FE products in new and existing buildings can contribute to green building credits for sustainable building design, and are a more versatile and cost-effective solution than fluoroketone-based products and inert gas systems. IFP

Reference

1. From Section 11, Closing Comments of the BFPSA review of the F-Gas regulations titled "Guidance Note – EC Regulation No. 842/2006 on Certain Fluorinated Greenhouse Gases – BFPSA Guidance for the Fire Protection Industry."

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Victaulic helps exhibit excellence

On any construction site speed is of the essence, but when the project brief was presented for one of the largest exhibition centres in the UAE with a timeline of eight months from start to finish, even the most seasoned project manager would see it as a challenge.

Thanks to the project management skills of ETA M&E Abu Dhabi and the use of highly experienced companies such as Victaulic, the Abu Dhabi National Exhibition Centre was completed on time for its first event, opened by the President of the United Arab Emirates His Highness Sheikh Khalifa bin Zayed al-Nahyan.

With such tight deadlines on the build, the 28,000m^2 exhibition space, owned by Abu Dhabi National Exhibitions Company, needed to use the fastest installation techniques available. Mr Jacob John, projects director for ETA M&E Abu Dhabi, oversaw the mechanical and electrical installations on site and explained that due to the high-profile nature of the Exhibition Centre, "any delay on meeting the grand opening deadline was unacceptable." This meant that work was carried out on-site around the clock and during the peak times of construction there were 2,600 M&E workmen on the project. "One of the biggest pressures we faced was ensuring manufacturers could meet our incredibly short lead times on deliveries and also be versatile enough to cope with the ever changing construction plans," said John.

The forecasting and planning procedures that we have in place at Victaulic enabled us to provide our standard fittings and couplings and our AGS large diameter system only eight weeks after the order was placed.

One of the manufacturers involved in the construction of the National Exhibition Centre was Victaulic, world leaders in pipe joining system manufacture. According to Rami Mahmoud, regional manager of the Middle East for Victaulic, "the foundations on the site were laid in February and due to the fast track nature of the job, we were called in to provide grooved-end couplings and fittings for the plant room, chilled water distribution and fire protection and portable water piping to begin fitting in May 2007.

"The forecasting and planning procedures that we have in place at Victaulic enabled us to provide our standard fittings and couplings and our AGS large diameter system only *eight weeks* after the order was placed. In addition, because Victaulic couplings do not require welding they could be installed quickly and without the limitations placed on a jobsite when welding is in progress".

The complexity of the building and its sheer size meant that large diameter piping was used throughout the chilled water system. The latest range of large diameter grooved end fittings and couplings from Victaulic, the AGS system, offers unprecedented performance and reliability and is ideal for installations such as the Abu Dhabi National Exhibition Centre due to its performance, speed and ease of installation.

For more information on the Victaulic product range or stockists in the Middle East please contact Rami Mahmoud, Victaulic regional manager Middle East on 00 971 4 883 8870 or visit www.victaulic.com IFP

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Pic courtesy of Hochiki Europe

For whom the bell tolls

Fire safety is going through a period of unprecedented change. New legislation, the evident switch from prescribed measures to engineered solutions, and the increasing availability of more sophisticated fire detection and alarm equipment are changing the fire safety landscape out of all recognition. Here, Graham Lowe, UK Sales Manager at Hochiki Europe, one of the world's leading designers and manufacturers of detectors and sounders, sheds some light on where the industry is going.

By Graham Lowe

UK Sales Manager,
Hochiki Europe

When John Donne included the lines: "send not to know for whom the bell tolls, it tolls for thee" in his 1623 sermon, he might easily have been writing about today's fire industry. What was once the exclusive preserve of fire brigades, equipment manufacturers and installers now affects us all. Changes in the regulatory framework covering both fire safety and health and safety generally, coupled with the rise in prominence of fire engineered buildings means that fire safety today is also the very real concern of property developers and architects; building owners and occupiers; company directors and facilities managers.

While globally fire safety legislation differs from region to region, if not country to country, the movement towards designing and constructing buildings that are frequently labelled "futuristic" has been made possible only by moving away from building control and fire safety regulation based on "thou shalt" prescriptive measures, to a legislative environment that focuses on what is needed to be achieved. "Modernism" buildings such as the architectural award winning Swiss Re "gherkin" building in London and many of the landmark structures now being constructed in the Emirates – examples of a truly new style of architecture – epitomise the design freedom that this change brought about.

In England and Wales, it was the enactment of the Regulatory Reform (Fire Safety) Order in 2006 that, more than any other legislative move, changed the face of fire safety. Up to then, we laboured under a staggering 120 distinct pieces of legislation that in one way or another related to fire safety. The most significant of these were the Fire Precautions Act 1971 and the Fire Precautions (Workplace) Regulations 1997.

New responsibilities

Until the Fire Safety Order became law, it was the responsibility of the enforcing authority to assess the level of fire safety required for each building. Acquiring the all-important Fire Certificate was, in

Pic courtesy of Hochiki Europe

many instances, the building occupier's only real concern. The Fire Safety Order effectively turned this position on its head, making the owner, occupier and employer responsible for fire safety, with the creation of the role of a "responsible person" who should be "competent". It also placed a reliance on risk assessments, and the need to take "reasonable" steps to ensure fire safety.

The perhaps predictable outcome has been that there is a very noticeable increase in the interest in product quality. If predictive legislation had one saving grace it was that, in the event of a fire, those concerned could rely for their defence on the fact that they had taken the measures as set out in the legislation. That you may now well be asked to answer for your fire safety measures, when poorly defined terms such as "reasonable" are embodied in the Order, means that there is only one "safe" course of action, and that is to adopt the best available solutions.

This brings us to the question of product approvals. The only reliable, not to mention "reasonable", way to ensure the quality of any fire safety product is to demand independent, third-party-approved test certification of the devices being delivered. This is the only dependable way to be certain that the compliance claims being made by the manufacturer are factual and accurate.

Another aspect of the Fire Safety Order and, on a more global level, fire engineered solutions generally, that is having a major impact on product selection is the cornerstone requirement for a fire risk assessment to be undertaken.

To be constantly effective, these must be considered as dynamic, on-going activities, rather than as a one-off event. This is because, in modern commercial life, organisations change and adapt to new trading circumstances. Often this means making quick changes to the building's use, or moving or expanding departments; what was once an office with a wholly appropriate sensor or detector becomes a test laboratory. So thought has to be given to the possible need to change the detection devices. Every time there is a structural alteration to the building, a material change of use to any part of the building, or a modification to the evacuation procedures, the fire risk assessment must be updated and appropriate changes made to avoid false alarms, protect the building structure and ensure the occupants' continued safety.

The wider perspective

In the UK, BS 5839:2002 (Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance) relates to all parts of the life safety system; everything from smoke and heat sensors, call points and sounders to input and output modules and control panels. Under this Code of Practice, products have to conform to a set of European standards. These include various parts of BS EN 54 (Fire detection and fire alarm systems). In the UK, BS 7974:2001 (The application of fire safety engineering principles to the design of buildings) is the appropriate methodology for fire engineers when developing fire engineered solutions.

This increased demand for visual devices has led to the development of more energy efficient beacons than earlier flashlight-based devices.

However, the installation designer and product specifier also has other legislation with which to contend. This includes legislation to safeguard the disabled, which in the UK is embodied in the Disability Discrimination Act. Designed to ensure equality of access, the Act defines a disabled person as someone with "a physical or mental impairment which has a substantial and long-term adverse effect on his ability to carry out normal day-to-day activities".

To comply with these requirements a visual warning may be needed, instead of or in addition to an auditory warning, for the deaf or hearing-impaired.

This increased demand for visual devices has led to the development of more energy efficient beacons than earlier flashlight-based devices. For example, Hochiki's solution for both analogue and conventional sounders is to utilise high-intensity

Pic courtesy of Hochiki Europe

LED technology that draws only a few milliamps of power. Visual and auditory alarms have also been incorporated into a single device where the sounder and beacon elements can be operated independent of each other.

Fire detection and alarm products throughout Europe also have to comply with the Construction Products Directive, which is applicable to any equipment or materials used in a building or, as the Directive defines it: "produced for incorporation in a permanent manner in works". This CE mark is a common method of performance evaluation across the EU.

Enhanced technology

At first glance, the general format for the detection and signalling of fires does not appear to have changed significantly in recent years. However, major strides have been made to improve the performance and reliability of the key components. Significant improvements have been made to the way in which individual products work together, and their ability to differentiate between a real fire and environmental pollution or other circumstances that previously may have initiated a false alarm.

These are particularly important advances in view of the need to ensure compliance with the new fire safety legislation and to have confidence in the fire engineered solutions where greater dependency may be placed on the performance of the fire detection and alarm installation. Hochiki's ESP – Enhanced System Protocol – analogue addressable open protocol has three features that contribute significantly towards a high immunity to false alarms. ESP provides what is called full digital transmission for exceptionally secure signalling; it incorporates Hochiki's Checksum error checking to safeguard the integrity of the data and ensure reliably correct communication. It also has high immunity from electrical noise, so there are no false alarms due to corruption.

One particularly noteworthy innovation is Hochiki's Flat Response high performance chamber technology, which is incorporated into all Hochiki optical sensors and detectors, including its intrinsically safe and marine-approved devices. This optimises the sensitivity to both smouldering and

Pic courtesy of Hochiki Europe

flaming fires. By re-engineering and refining the internal optics, it has enhanced the sensor's or detector's reaction to a wider range of inputs than is possible with less sophisticated devices. To further boost immunity from false alarms, Hochiki also has a suite of false alarm management tools called ARM – which stands for Alarm Reduction Management – within the ESP system, which includes Drift Compensation that, when activated by the control panel, automatically recalibrates sensors every 24 hours.

By re-engineering and refining the internal optics, it has enhanced the sensor's or detector's reaction to a wider range of inputs than is possible with less sophisticated devices.

At the same time, major strides have been made to enable the widespread use of more sophisticated technology that empowers a much wider cross-section of the commercial and industrial community to utilise the best available technology ensuring compliance with such legislation as the Fire Safety Order.

These innovations include, for example, Hochiki's new modular voice alarm system called FIREvac, which brings voice alarm technology to a whole raft of new potential customers. It delivers all of the benefits of voice evacuation at a very affordable cost, can be easily integrated with an existing fire detection and alarm installation, and is designed to simplify achieving an installation that is fully compliant with BS 5893-8:1998 (Code of practice for the design, installation and servicing of voice alarm systems). Another development that provides new options at the specialist end of the market is Hochiki's new FIRElink high-sensitivity smoke detection system that incorporates advanced semiconductor laser and electronics technology into a package that also shows substantial savings in whole-life cost.

It tolls for thee

So, the comfort zone that may once have existed where regulations told us what to do and where fire safety was seen ultimately as someone else's responsibility are gone. Globally, fire safety should now be on everybody's agenda.

The design freedom that is now eagerly embraced by architects, the groundbreaking progress made in structural engineering, and the creative advances in fire engineering are sure to result in a greater number of buildings that demand even more from the fire detection and alarm community. At the same time, building owners and occupiers are awakening to the fact that they now, in the UK at least, have legal responsibility for fire safety, which they may one day be called upon to defend in a court of law.

The implications are clear. When it comes to fire safety, do not bother asking for whom the industry's alarm bell is ringing. It is ringing for you, for me, for everyone. IFP

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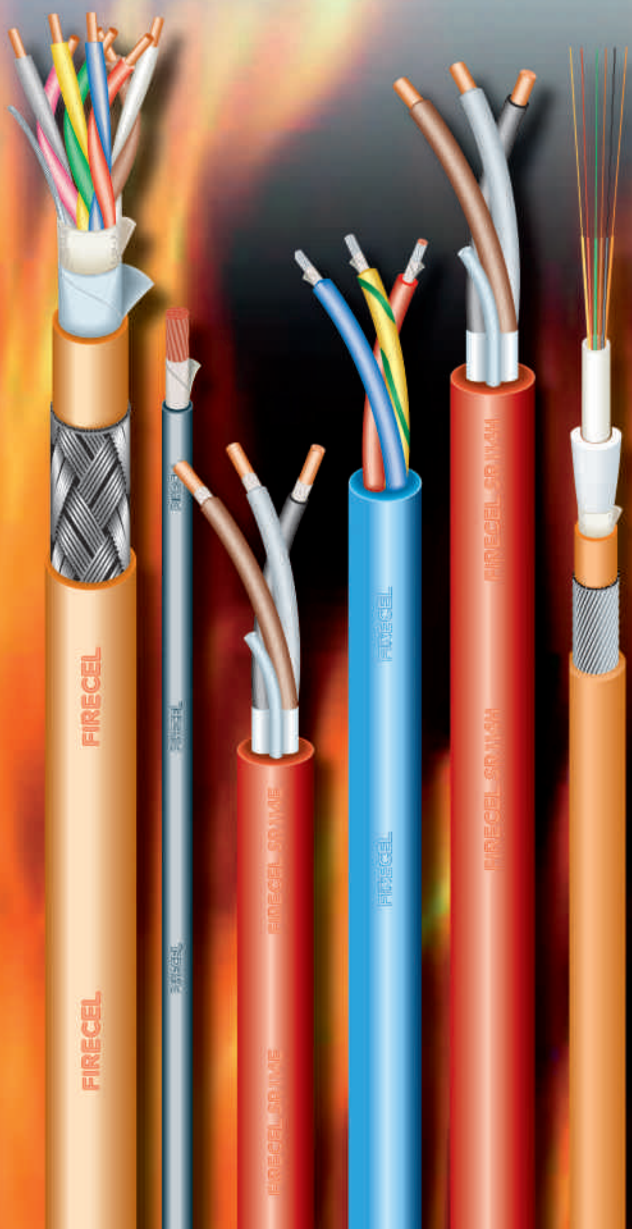

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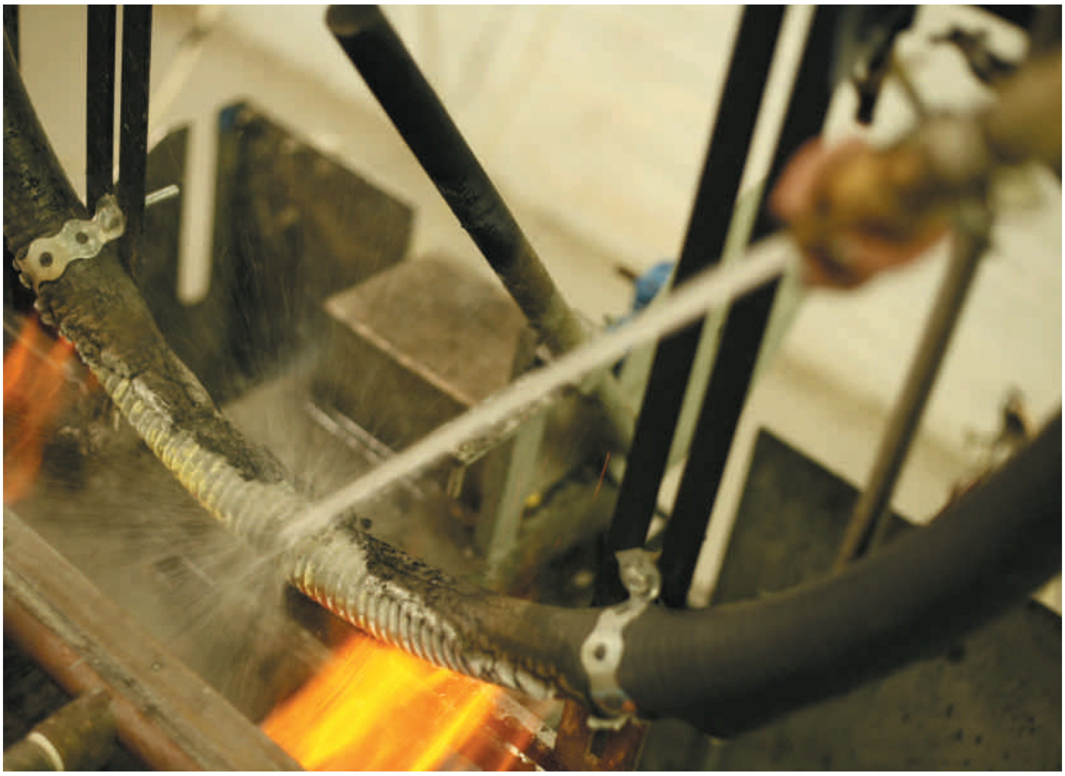
Prysmian FP600 undergoing testing to requirements of BS 7346-6 using fire with direct impact and water jet



Don't let fire performance become a burning issue

With concerns that faulty and non-compliant cables are infiltrating the electrical industry, Ufuk Colak, Marketing Product Manager at Prysmian Cables and Systems explains why no one should cut corners when manufacturing, specifying and installing fire performance cables.

Ufuk Colak

Marketing Product Manager,
Prysmian Cables and Systems

Architects are designing bigger and more complex buildings, so incorporating fire safety into the design of a building through the use of fire performance products is becoming ever more important.

The safety of electrical systems should not be left to chance, which could happen if specifiers and contractors choose price ahead of features such as reliability, durability and third party certification when specifying and installing fire performance cables. These should be top of the agenda if contractors want peace of mind.

You get what you pay for

Independent fire investigations show that many major fires could have been prevented if fire safety, both active and passive fire protection, had been included as an inherent design feature.

The British Approvals Service for Cables (BASEC) has also witnessed a greater number of sub-standard cables in the last year, which it believes, is a direct result of rising copper prices. It blames the nature of the electrical industry where price often becomes the principle reason for choosing a cable.

Fire performance cables provide power distribution to essential life safety systems such as emergency lighting and fire alarm systems, so it is paramount that these products are manufactured to the highest specification.

Some manufacturers or importers may be tempted to cut corners by reducing the amount of copper used in the manufacturing process and or

Prysmian's FP600 fire resistant cable installed at the Royal Festival Hall

using insulation materials without the correct degree of flame retardance, which means that potentially some wholesalers, distributors and contractors are exposing themselves to unnecessary risk.

If specifiers and contractors use inferior cables it could only be a matter of time before the safety of an electrical installation on a site is compromised because of poor quality products, which do not conform to the correct British Standards. In those circumstances the wholesalers, distributors and electrical contractors could be held to account. The Regulatory Reform (Fire Safety) Order stresses the need to use only superior proven products and places more responsibility on specifiers, wholesalers, contractors right through to the building owner.

Fighting fire through product development

Responsible manufacturers would warn against installing fire performance cable that is not compliant with British Standards or Approved by a third party such as BASEC or LPCB (Loss Prevention Certification Board). The new generation of fire performance cables are designed to meet much more arduous fire survival requirements now demanded by regulators and specifiers, for applications such as life safety systems, property protection and fire fighting systems in buildings that must remain functional in the event of a fire.

It's during the development of these high performance products that fire testing facilities take centre stage, such as Prysmian's fire testing facility in Bishopstoke which carries out in excess of 1500 tests per year, and helps set the leading FP cables apart from the rest.

In house fire testing laboratories allow manufacturers to run quality assessments on existing cables, new cables and materials, type approval for products or contracts, customer service demonstrations, and development of new fire specifications for the industry. This ensures that cables comply with stringent British and European Standards, which set the benchmark to provide specifiers and installers with the correct knowledge and understanding about a cable's fire survival time, flame propagation and smoke emissions. They also set out the environment and equipment that should be used when conducting fire tests, coupled with details to make sure all tests relevant to a particular standard are carried out under the same conditions.

Prysmian FP200 Gold undergoing testing to requirements of BS 6387 Category C to test resistance to fire alone

Testing capabilities

The fundamental feature of having a leading fire testing facility is that it allows cables to be observed throughout the development process. The cables can be observed during the whole test process and this allows researchers and testers to record any changes during different stages of testing. Engineers can then make calculated judgements on how well cables have performed and how they can be improved.

There are three main tests conducted on fire performance cables – fire resistance, flame propagation and smoke emission tests. The fire resistance test measures the time that the cable continues to function under set conditions, retaining its electrical circuit integrity. The cable is mounted using fire-resistant clips and a burner is placed under the cable. A defined mixture of air and propane is fed into the burner to produce a test flame and the cable set alight with temperatures reaching up to 950°C. Fire resistance can be tested with the cable being exposed to different conditions: fire alone, fire and impact, fire and water, or an integrated fire, water and impact.

Impacts may simulate falling materials in a building with water spray or blasts used to replicate sprinklers or fire fighting hoses in a fire situation.

Flame propagation tests examine how far a cable burns in a vertical position when exposed to a large test flame before it stops burning. Cable is fixed so that it runs vertically inside a fire testing chamber to simulate installation within a building.

Smoke emission tests involve burning cable in a smoke cube, which contains a light source at one end and a light sensor at the other. The cable is set alight and emits smoke into the chamber. The percentage drop in the amount of light travelling from the source to the sensor is calculated and must not drop below a certain percentage depending on the test being applied.

Royal Festival Hall Auditorium – image taken at the acoustic tuning concert on 28 April 2007, featuring the London Philharmonic Orchestra

An evolving market

Increasingly as well as meeting the required standards, specifiers and engineers are looking at the bespoke situation for each building and want to test products to see how they would perform in that particular scenario. The sophistication of the market place is evolving and this is often how the development of new standards comes to fruition.

One example is Southbank Centre's iconic Royal Festival Hall in London, which has re-opened to the public following a £91 million two-year refurbishment project, involving the renovation and renewal of essential life safety systems.

The ambitious refurbishment project of this Grade I listed building began in 2005 to improve the auditorium acoustics, technical requirements, audience comfort, access, visitor facilities and general condition of the entire building, all of which was in need of modernisation. As with any large public venue on this scale, life safety systems are of paramount importance, which was why fire performance cables were specified to power essential life safety and fire alarm systems. With such a key role to play in the event of a fire it's imperative that these are manufactured and tested to the highest specification.

Leading engineering consultancy, Max Fordham LLP, was appointed to design and overhaul the full mechanical and electrical services, except the theatre. During the planning stages in early 2004, the decision was taken to opt for a robust armoured cable for the uninterrupted power supply and emergency lighting sub-mains cabling. However, at that time Prysmian's FP600 was a new cable and the first of its kind on the market, which meant it was not listed in the Technical Standards of Places of Entertainment regulations (often referred to as the Yellow Book), which stipulates the technical requirements imposed by local licensing authorities to ensure the safety of the public, staff and performers in all places of entertainment.

Max Fordham LLP had to design the specification in accordance with the Yellow Book so that the venue could obtain the entertainment licence, but because FP600 was brand new to the market it wasn't listed in the guidance notes.

Project engineer Mark Nutley and his team had been in discussions with Prysmian, going back six years and when they submitted their tender package it included a caveat that the appropriate cable fire resistance tests had to be carried out in order to proceed with FP600.

The proposed design was then put forward to main contractor ISG Interior Exterior, Lambeth's District Surveyor and Building Control and involved a visit to Prysmian's fire testing facility, to see cables put to the test.

It was important to ensure that the cables complied with the latest and most stringent British and European Standards, which set the benchmark to provide specifiers and installers with the correct knowledge and understanding about a cable's fire survival time, flame propagation and smoke emission. They set out the environment and equipment that should be used when conducting fire tests, coupled with details to make sure all tests relevant to a particular standard are carried out under the same conditions.

This allowed Prysmian to demonstrate to Lambeth the enhanced performance of the cable, giving Max Fordham LLP the green light to include it in the specification.

Lambeth and ISG were shown FP600 being tested to the requirements of BS7346-6:2005, which involves an integrated fire test with the cable exposed to flames, direct impact (simulating falling debris) and water jets used to replicate fire fighting hoses in a fire situation and achieved the maximum 120-minute rating.

Quality

The quality of fire performance products should always be paramount, not only to help save lives, but to enable specifiers and contractors to comply with the increased legislative burden placed upon them. Ensuring a cable carries the correct third party approvals is a small price to pay for reassurance. Combined with the meticulous examination of manufacturing processes and controls by cable producers, third party approvals help to guarantee continually high quality levels. Some manufacturers such as Prysmian subject their cables to more rigorous tests so that products are designed to go beyond the criteria set in British and European standards and provide customers with the best quality available. IFP

Ufuk Colak is Marketing Product Manager at Prysmian Cables and Systems Limited in the UK. He joined Prysmian in 1994 as an electrical engineering graduate working for the commercial side of the business and then moved into various marketing roles in Turkey. Ufuk joined Prysmian UK in summer 2007.

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Pic courtesy of Rectorseal Inc

Maintaining Proper Fire Protection, After the Building is Complete

By Randy G. Clark

Firestopping, the art of maintaining or re-establishing fire-rated barriers, has several enemies; one of them is neglect.

Neglect, as defined here, occurs after the construction phase has taken place and the building has been occupied. It is when, even after great effort and expense, the building has been properly firestopped that the firestopping becomes compromised by lack of maintenance. By failing to repair damaged seals or by failing to properly firestop new penetrations created during the life of the building, neglect has occurred.

It has been a short twenty years (1988) since firestopping was first mandated by a National Model Building Code (UBC). Some may say that there has been a struggle during the last 20 years for firestopping to become a vital and recognized part of a balanced approach to total fire protection: Detection, Compartmentation and Suppression. Great growth has been seen in the development of numerous products and technologies that have greatly advanced and enhanced the firestop industry. As an example, with the development of various intumescent technologies, we have seen rapid growth in the approval and the use of non-metallic piping and other combustible insulations within Building Codes. Some will say that the influence of the development of these intumescent technologies and products have made certain elements and components of the building less expensive and easier to construct. Additionally, we have seen a steady rise in the level of awareness of proper firestopping in the architectural and engineering communities and in the enforcement of firestopping, as found within the Codes by the Building Officials across the country.

Yet, with all of this having been fought for and put into place; we have failed to properly address the need to have requirements for the maintenance of the firestopping.

Starting Conditions (if the Codes have been enforced)

We start with the Concept of the building which results from the collaboration of the Architects and Engineers in the creation of the Specifications and Architectural Drawings. These are then submitted to the local Building Officials for the Plan Checking Review process before a building permit is issued. Construction begins and periodically during the time of construction, various inspections

Pic courtesy of Rectorseal Inc

take place to insure that the construction methods and techniques are meeting with the requirements of the local Building Code. Only after the final inspections have taken place and the construction approved will there be the issuance of the final Certificate of Occupancy (C of O). Now, the Life of the building begins.

We assume at this point, that all construction joints and penetration seals between and within fire-rated barriers have been properly firestopped.

Causes

Construction being complete, the building is ready to be occupied. However, as tenants move in, various trades are engaged to install computer systems, phone systems and various other services as required to fit the tenant's needs. At this point or later as the individual tenant's needs change, additional alterations to the building services are completed. Without proper details (firestop designs) by which to complete the installations, the likelihood is that, if a fire-rated barrier is penetrated, it will be compromised.

Multiply this scenario by the number of individual tenants.

This lack of proper planning or of having proper procedures in place by the building management to regulate or oversee tenant installations could easily result in the reduction of the total fire protection of the structure.

Possible solutions

Total fire protection should consist of a "Balanced Approach" made up of three parts: Detection, Suppression and Compartmentation. For Detection, we rely on fire and smoke detectors which will alert the occupants and possibly the fire department as to the existence of a fire. Suppression, the 'active' portion of the triad, will be covered by the sprinkler system which will be used to help to control the fire. Compartmentation, the 'passive' portion of the Balanced Approach, is represented by fire rated walls and floors which have been maintained by proper firestopping.

Having now set up conditions where the potential demise of a vital portion of the building's fire protection could take place; what can be done to prevent it from happening? How best can we 'maintain' the integrity of the firestopping of the structure?

First, after the building has passed its final inspection and the Certificate of Occupancy has been issued, the local building authorities typically do not conduct any additional post construction inspections, unless there is a major remodeling project within the structure. Therefore, if the building is to maintain its fire protection for the life of the building, the building's management must take the lead in that responsibility.

For this to be done, the building's management must have a plan in place.

Management must first be able to identify the fire-rated barriers. This can best be done with the aid of the building's architectural drawings. These plans will identify each of the fire rated barriers and their ratings. With these plans, management will need to create a simple set of drawings which clearly identify each of the barriers and their ratings.

Building management must create a plan of action.

This plan of action should include a policy issued to each tenant as part of their contract which states that the building management must be notified whenever the tenant intends to make any alterations or modifications to his area which might require the installation of or removal of services from the area.

The building management should have an opportunity to review the plans and to approve the materials and methods to be used to restore the fire rating of any barrier which will be compromised. Sufficient data including product information and the design drawings to be used for each condition must be submitted before any work begins.

In addition, building management should have a list of several professional contractors in the area whom they can recommend to the tenants, if needed. These contractors should either have been trained by the firestop manufacturers or who have Firestop Installers Certifications from recognized national independent approval organizations such as Factory Mutual (FM) or Underwriters Laboratories (UL). By using properly trained contractors who use approved materials in specific approved system designs for each application, the building management can be assured of maintaining the fire integrity of their building.

Lastly, building management must have the work inspected upon completion, to insure that the integrity of all of the fire-rated barriers was maintained. The inspections must be performed by qualified individuals who will rely not only on the data and system designs submitted, but also possibly by performing destructive inspections of a random sampling of installations. Destructive inspections are those where an actual installation is 'cut into' or 'disassembled' in order to examine measure and verify compliance to the system design submitted.

In order to maintain proper fire protection for our buildings, we must be willing to assume the responsibility, throughout the life of the building, to maintain its Life-Safety. By having an action plan in place and by seeing that the plan is implemented, fire protection will be an ongoing concern and not simply end with the completion of construction. By taking a more pro-active approach, lives will be protected and management will have eliminated a potential liability. IFP

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Water mist in marine fire fighting

Up until very recently, fire fighting systems in ships were very traditional systems, mainly consisting of CO_2, other gases, foam and halon in the engine rooms and a few cases of traditional sprinklers in the accommodation areas, and of course the fire main.

By Erik Christensen

Vice President,
Danfoss Semco A/S

Now halon has been phased out for almost all commercial purposes, and concerns have been raised about the use of CO_2 in manned or otherwise occupied areas; regarding environmental issues concerning most chemical gases; health and environmental issues rising from the use of foam in engine rooms; and the danger of heavy corrosion of equipment if released, as well as a wide range of concerns regarding the use of other gases. All these problems have caused safety-minded owners and architects to turn to water mist systems.

Since the introduction of water mist systems in the mid-1990s, these systems have gained ground, as a very powerful suppression system in accommodation areas. This tendency was developed further as a result of new regulations for passenger ships initiated after the "Scandinavian Star" incident, and water mist systems are now the dominant as means of fire suppression in accommodation areas on passenger ships. The obvious benefits of water mists such as the use of less water, the smaller pipes, the lower weight, the superior fire suppression capabilities as well as the excellent cooling effects speak for themselves.

The water mist has also been introduced to the engine spaces, initially as total flooding systems to replace Halon based systems, and again the benefits of having a system that does not comprise a danger to human beings, equipment, or to the environment, is purely based on water, and is very efficient in fire fighting and cooling was seen to be very attractive. However, the first test standard MSC 668 did, in practice, not allow for the systems to be introduced to large engine rooms, most systems could serve engine rooms of up to 3000m^3.

A revised test standard, the MSC 1165, has recently been introduced and the new systems that have come to the market since are able to serve engine rooms up to 5000m^3 or even larger.

Pic courtesy of Danfoss Semco A/S

However, to be able to serve even larger engine rooms new standards and test standards should be introduced, preferably with the possibility of sectioning the engine rooms, in order not to have too large pump systems serving the large spaces.

The benefits of the water mist systems have been utilized in the local application systems, such as a system that covers the most hazardous objects, objects that, according to incident reports, were known to cause the majority of the fires in engine rooms. These systems can be released very quickly, even with personnel in the engine spaces, are automatically released in unmanned engine rooms and can suppress the majority of the fires at very early stages. The water mist system is often described as the substitute for the man with the hose or extinguisher, who is no longer on duty.

These systems already have a good track record in suppression of fires and are one of the initiatives that, made by the IMO organisation, add to the safety of ships.

New areas for water mist systems in marine fire fighting

All the benefits and the experience collected from the use of the water mist system, have led to new initiatives for increased fire safety on ships. The IMO Fire Protection committee is working to introduce new standards for installation and testing of water mist systems for the protection of balconies and car decks for RO-RO vessel. These standards will probably be introduced in the very near future.

Following a major incident with a balcony fire on a large cruise vessel, it was brought to the fore that a highly combustible area of the ship was, in fact, neither covered by a detection system nor by a fixed suppression system, due to missing requirements to this area. However, as soon as this was realised, the owners and legislators reacted very quickly to remedy the situation in order to

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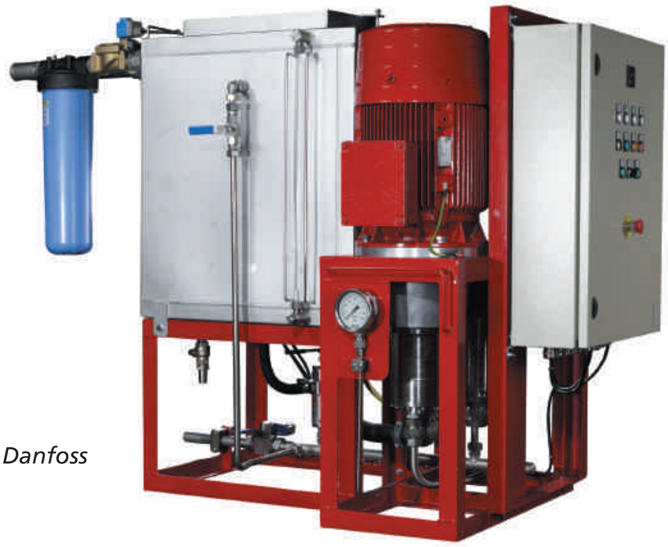

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enhance safety. Several ships immediately installed voluntarily systems, and new regulations for detection, testing and installation of fixed suppression systems were drafted with effect as from July 2008. Some water mist systems are already tested according to the new test standards.

On car decks drencher, foam and CO_2 systems have been dominant; however the systems have drawbacks: CO_2 is obviously not suited for open ended decks and even for closed decks, there is the problem of lack of coverage during loading and unloading, as well as the toxicity problem when the system is released.

Foam is well known as entailing very aggressive corrosion risks. Getting the right mixture can also be difficult and, consequently, the build up of the foam may be problematic.

Drencher systems are characterized by pouring a lot of water onto the protected area, consequently, if not drained properly, causing stability problems, etc.

Water mist will eliminate many of these problems. It is based on pure fresh water, is harmless to human beings, environmental friendly, entails no corrosion dangers, and is very efficient in fire fighting, also during loading and unloading. Furthermore the system may be released even when a space is occupied.

If and when the new regulations come into force the water mist systems can effectively protect many areas of many ships.

The water mist is not just water mist

Often the water mist is just mentioned in the specifications as "water mist"; however, there are significant differences between water mist systems in the performance and in the quality of the systems.

As a general rule, it can be said that the higher the pressure, the lower the water consumption and the more effective the use of water. Also, with higher pressure the diameter of the pipes is often smaller, which will ease the flexibility of the installation and reduce the quantity of water reservoir in the pipes.

The droplet sizes are very much dependent of the design of the nozzle head and the pressure. Very sophisticated heads can generate very small droplets that will be airborne for a longer time than larger and heavier drops, which have a tendency to fall on the floor and be wasted. The smaller droplets will be exposed to the heat from a fire for a longer time. They have a relative larger surface compared to the larger drops, and they will consequently evaporate easier, expanding 1700 times the volume to steam, depleting oxygen, and absorbing a remarkable amount of heat.

In general, higher pressure is able to produce smaller droplets and throw the water longer.

The water mist systems are often classified in the below classes by pressure and droplet sizes in accordance with the UPTUN Engineering guideline 251 rev 8:

Table 1: Droplet Size Classification

Medium Droplet Size ($DV_{0,9}$)	Type of System
< 200 microns	Class A
200–400 microns	Class B
> 400 microns	Class C

Table 2: Working Pressure Classification

Minimum Working Pressure	Type of System
< 60 bar	High Pressure System
16–60 bar	Medium Pressure System
< 16 bar	Low Pressure System

For the measuring of the $DV_{0,9}$ refer to prEN/TS 14972.

The quality of the systems

There are very different systems on the market; and it is paramount that systems are designed for durability and reliability for many years. Often the most reliable systems are those that are designed aiming for simplicity and easy operation, and do not have too many parts.

Also the materials should be first class, non-corrosive and of high class, i.e. stainless steel to an appropriate grade, should be used for pumps and pipes in order to ensure a long life without corrosion.

One should remember that the system will be on standby mode at most, or hopefully all times. However, should it be needed it will be instantly required and no malfunctions can be tolerated. It has to be in good shape during its entire life.

No compromises on quality should be allowed.

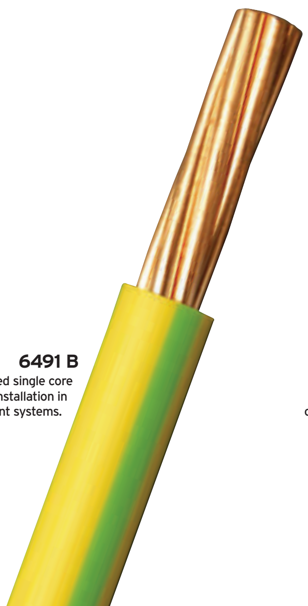
Service

For all systems it is advisable to have qualified service personnel check the condition of the systems at least once a year, and to have a check run for major parts according to the manufacturers service charts and service instructions.

Conclusion

If a high quality water mist system is chosen to protect your vessel which is fire tested to an approved fire test standard, installed to a system standard and if the system is serviced at regular intervals, significant measure have been taken to mitigate any incidents, as well as reducing the risk of fire-related accidents severely damaging your vessel, and the risk of loss of life with all the costs involved. IFP

IN CASE OF FIRE, F



6491 B
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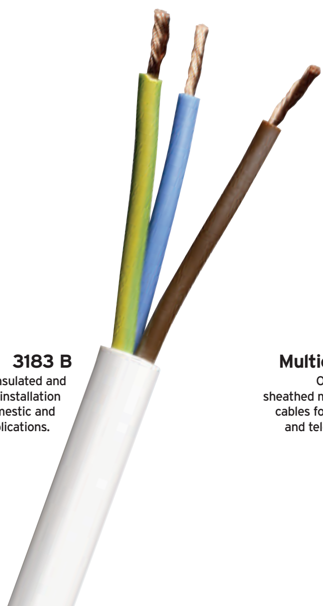

3183 B
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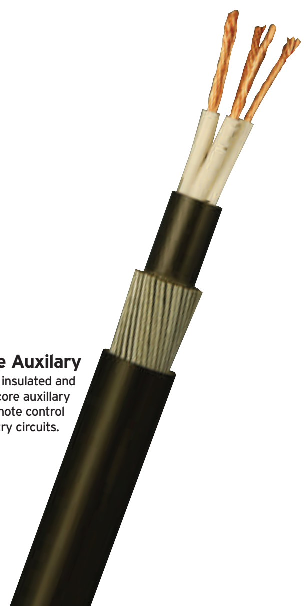

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Pic courtesy of FIA

Portable Extinguishers – Still a Vital Role to Play

By Robert Thilthorpe

Technical Manager, FIA

Fire extinguishers are often the unsung hero of the fire protection community yet without them the already considerable losses attributable to fire would undoubtedly be much greater. Installing the correct extinguisher to meet the needs of a given environment is an important step but in these days of risk assessment, particularly given the new legislation introduced in the UK with the advent of the Fire Safety Order, it is equally important that extinguishers are fit for purpose and are regularly maintained.

The Fire Industry Association (FIA) was formed in April 2007, merging the UK's two leading associations within the fire protection industry: the British Fire Protection Systems Association (BFPSA) representing the UK fire systems industry and the Fire Extinguishing Trades Association (FETA), representing those companies responsible for the manufacture and maintenance of portable fire-fighting equipment. Prior to the formation of the FIA, FETA conducted a number of surveys into the use of portable extinguishers, demonstrating just how important extinguishers are in the fight against fire. The most recent survey showed that some 80 percent of fires are dealt with by a portable fire extinguisher without the need for fire brigade intervention. In terms of commercial losses, it is the extinguisher's role in preventing a relatively minor incident turning into a major conflagration which needs to be recognised, particularly in view of the statistic that some 75 percent of companies that experience a serious fire go out of business either directly as a result of the fire or within three years of reopening. As those in the fire protection community know only too well (as do those companies that have experienced a fire), the problems of a fire extend well beyond the more obvious ones of a burnt-out building and ruined stock. There are also the consequential

Pic courtesy of FIA

losses from the resulting business interruption, with customers forced to find alternative suppliers, often not returning and therefore proving the death knell of what was once a thriving business.

Fire Fighting Media

The different foams employed in portable fire extinguishers continues to be an issue, both in relation to selecting the correct extinguisher to fight the fire and also in how to correctly dispose of the media. Choosing the correct extinguisher for the fire risk is an essential part of the fire management planning for any premises. There has been a tendency in the past to perhaps over-specifying foam extinguishers on the basis of their ability to fight most fires without properly assessing the risk. In recent years this has lead to concerns regarding how to safely dispose of foams. A lot of information has appeared in the press about the environmental impact of fire fighting media. long chemical names, or their shortened versions e.g. PFOS, PFOA, are used to enlighten or perhaps confuse the reader. However there has been little practical guidance for the end-user and practitioner.

After long consideration and discussions with

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various government agencies, FIA has published a series of Environmental Fact Files (Nos 24 to 27) which provide guidance on the general legislation applicable to fire extinguishers and fire extinguisher companies (No.24) and then looking at the environmental considerations for foam(No. 25), powder (No.26) and Class F (No. 27) extinguishers. Each Fact File provides guidance on the selection of the extinguisher, how to handle the media on the customer's premises and on the service company's site. They then go on to give guidance on the various methods of treating the media in an environmentally safe manner. Discussions with regulators will continue and, as UK law changes, the Fact Files will be amended.

Extinguishers v Sprinklers

Another area which prompts considerable discussion is the debate concerning sprinklers versus extinguishers. The received wisdom within the fire safety community is that each has their role to play. Surely it should not be a case of which technology to employ but rather to what degree each is used. When you consider the statistics already alluded to, namely that 80 percent of fires are extinguished without the intervention of the fire service, plus the fact that within that 80 percent portable extinguishers are by far the most widely used method, completely ignoring this first aid fire fighting opportunity makes no sense.

In schools this is particularly pertinent. Statistics show that arson is one of the major causes of fire damage in the nation's schools but it is perhaps only when you look at the statistics that the scale of the problem becomes truly apparent. Every week in Britain, 20 schools are likely to suffer an arson attack, with one third of these attacks taking place while pupils are in class (i.e. when people are on hand to potentially intervene and extinguish a fire). The cost of clearing up after school fires continues to soar to a staggering £92 million. When you look at what that equates to in

Statistics show that arson is one of the major causes of fire damage in the nation's schools but it is perhaps only when you look at the statistics that the scale of the problem becomes truly apparent.

terms of lost potential investment in the education system, it provides a sobering picture – the equivalent of building 45 new primary schools or employing an additional 3,750 teachers. Although already dramatic, this figure does not allow for the consequential losses that arise from a significant majority of fires such as lost data, books and records, as well as the disruption to the learning process and the emotional effects on staff and pupils.

Furthermore, these figures are probably only the tip of the iceberg since many smaller fires are dealt with successfully by portable fire extinguishers, before they have the opportunity to become major incidents, and therefore go unreported.

Given that arson attacks are often started by setting alight rubbish, including that which may be outside the building and therefore unprotected by a sprinkler system, fire extinguishers should be an integral part of any school fire safety strategy. An opportunity may well present itself to tackle a small fire but if there is no extinguisher available to do so, then this window of opportunity is lost. To activate a sprinkler system a fire has to be well developed, even if ESFR heads are employed – in many cases a prompt intervention with an extinguisher could deal with the fire before it reaches the point at which the sprinklers would activate.

A Task Group under the auspices of BSI committee FSH/2 has been working over the last year to revise BS 5306-3 "maintenance of portable fire extinguishers" and BS 5306-8 "Selection and installation".

There is also the consequential damage caused by the activation of a sprinkler system to consider. This is in now way an argument for not installing sprinklers but rather a recognition that it is surely better to contain a situation to as small an area as possible than await the activation of the sprinkler system which inevitably affects a much wider area, albeit considerably less than if the Fire & Rescue Service is required to extinguish a developed fire.

Revision to Standards

A major consideration for the UK is the imminent revision of BS 5306, the standard that relates to fire extinguishing installations and equipment on premises. A Task Group under the auspices of BSI committee FSH/2 has been working over the last year to revise BS 5306-3 "maintenance of portable fire extinguishers" and BS 5306-8 "Selection and installation". When considering 5306-3, the group has been updating the standard in terms of what needs to be done when servicing extinguishers and has been addressing the area of training and examinations. When the standard is released for comment later in the year it will undoubtedly generate considerable debate. The selection standard "part 8" is being aligned with the Fire Safety order. FIA has been actively involved in this work and will continue to be involved during the public consultation period by organising special interest group meetings to collect the views of its members.

Black Hole

Returning to where we began, namely that often fire extinguishers do not receive the recognition that they deserve. Part of the problem is undoubtedly that their use often goes unreported save for the stories of heroic actions by members of the public. If the fire service is not called to an incident, then it effectively never happened in terms of official statistics. If it were possible, what an interesting exercise it would prove if we were able to overcome the problems of this 'black hole' and calculate what the costs of fire would be without these unsung heroes. IFP

Pic courtesy of Honeywell UK

Multi-Criteria Fire Protection – the Technology of the Future?

The past century has seen dramatic changes in the way in which people, property and the environment have been protected from fire, driven in major part by broader technological advances such as the introduction of microprocessors.

By Rick Love

Technical Manager UK, Honeywell

From the earliest ionisation smoke detectors to the very latest multi-criteria fire protection devices, the ultimate goal has been to reflect the human being's ability to use different senses to make a rapid and accurate judgement on the presence or otherwise of a fire and react accordingly.

Early developments

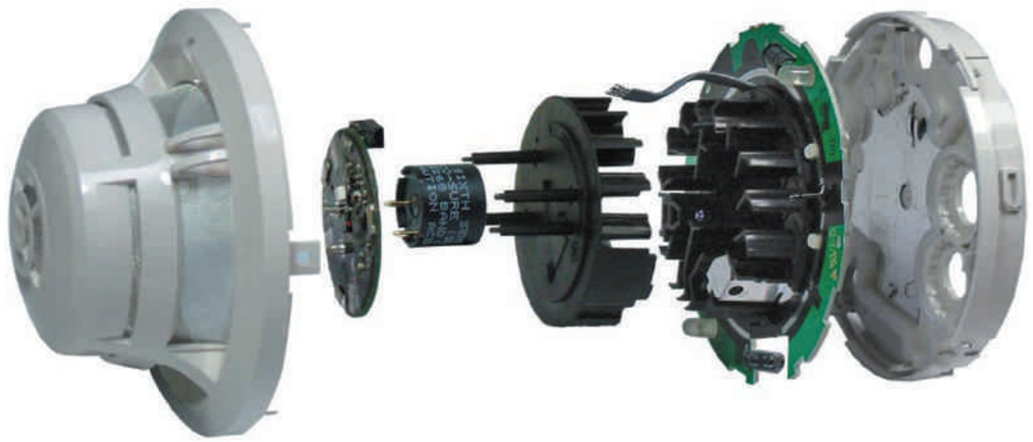
In the first years of the last century, among the earliest automated fire protection devices were ionisation smoke detectors developed in Japan. Together with early heat detectors, these were switches which essentially operated like an on/off switch controlling a central heating system.

As electrical switching became more established, such detection devices were linked to sounder devices such as electric bells to provide a combined detection and alarm system – usually mains powered and almost exclusively at this stage designed for commercial premises rather than domestic use.

Post-1945, the next significant development was that of photo-electrical detectors, enabling optical detection for the first time. Though expensive to produce and initially regarded as less reliable, as electronics improved and ionisation technologies fell out of favour – in part due to environmental concerns – optical devices became central to the development of subsequent fire detection strategies.

Again driven by more broadly-based technology developments – in this case the emergence of the microprocessor – perhaps the most significant development has been that of the addressable fire

Pic courtesy of Honeywell UK



protection system, which came to the fore in the mid-1980s.

Here, rather than straightforward detection the approach was to provide information to the user, who was now able to discriminate, not simply to a pair of wires but precisely to an individual address point. As a result, it became possible to reduce the search time required, by locating the source of the fire much more quickly.

This also enabled greater intelligence to be placed around the fire decision. Previously a simple switch, the detector was now a sensor which could provide information to a central control panel which could then be processed, leading to better quality decision-making as to the presence of, and most appropriate response to, a potential fire situation.

Multi-criteria detection

As human beings, we are able to combine criteria to make the most appropriate response to external stimuli. Thus, if we smell smoke, we will move in the direction of the source to establish whether or not there are flames. Similarly, the earliest multi-criteria detection devices took a relatively simple, 'if this and that are present, there must be a fire' approach.

Such devices, which emerged in the 1990s, initially combined ionisation and optical detection together with a thermal sensor and operated on the principle that activation of at least two of the three parts of the device indicated the presence of a fire. Again, initial take-up was limited on the grounds of cost and the fact that this seemed to offer no greater intelligence than the 'voting system' provided by linking different types of stand-alone detection – rather than combined within a single device – and looking for more than one to be activated.

For many years, ionisation-based detection was seen to provide the best form of fire protection – and was certainly the cheapest to produce.

The next key step resulted from the realisation that this information could be brought together much earlier than at the point of final decision. By assessing the combined presence of some heat and smoke, say, in either the control panel or the sensor, it becomes possible to go to alarm much more quickly.

For many years, ionisation-based detection was seen to provide the best form of fire protection –

and was certainly the cheapest to produce. Yet in addition to environmental concerns, it was prone to false alarms in high air velocity and humidity environments and manufacturers have worked to find suitable ways to replace ion detectors.

As a result, different types and levels of multi-criteria device have emerged. Most typically offer a combination of optical and thermal elements, capable of picking up fast-flaming fires which generate little smoke but a great deal of heat, for example. The disadvantage is that the reaction to an increase in temperature is slower than that to smoke.

In addition, infrared (IR) detection is better suited to picking up invisible particles produced by fire and is also able to provide a rapid response, but on its own is restricted by dependence on line-of-sight. Airborne particulates are a common source of false alarms for optical devices and here, carbon monoxide (CO) detectors not only provide additional fire detection capability but also minimise false alarms by differentiating between dust or steam and smoke.

Infrared (IR) detection is better suited to picking up invisible particles produced by fire and is also able to provide a rapid response.

From a technology stand point, much of this development has been essentially evolutionary. However, the ability in particular to incorporate IR within a point detector in this way marks a major advance in recent fire safety technology.

Intelligent response

All fires have three elements in common, in that they produce CO, heat and smoke. The proportions however will be different in each case, as will the time when each element is released. Similarly, a fire will almost certainly produce a changing light signature, primarily as a result of flame development.

Just as a human being picks up on these changes through the use of different senses, the latest sophisticated multi-criteria devices, typified by Honeywell's Smart[4] detector, combine the four sensing elements of CO, IR, smoke and heat detection within a single unit in order to detect different kinds of fire faster.

Further, with sensors managed by advanced algorithms these can be configured to operate normally at a high immunity level, instantly changing to become very sensitive to fires as soon as fire characteristics are sensed. Critically therefore, transient nuisances are ignored, so minimising the false alarm rate.

Looking ahead

So, is multi-criteria detection the way ahead for fire protection? This would certainly appear to be the case, as CO devices, for example, become more commonplace and combined optical/thermal devices have moved from their earlier niche positioning to more mainstream application.

More broadly, the fire industry generally across Europe is moving, subtly perhaps yet demonstrably, from the stance of 'let's detect fire better' to

Pic courtesy of Honeywell UK

one which might be characterised as 'let's prevent false alarms'.

The reason for this, not surprisingly, is primarily economic, as the cost of downtime or lost business increases, together with a loss of confidence in the system itself. As a result, the reduction in false alarms is now a principal product development focus within major fire safety equipment manufacturers.

And here, critically, multi-criteria sensors are inherently less prone to false alarms than their single sensor counterparts, as it is more difficult to falsify two criteria than one, three more than two, and so on.

At the same time, as development concentrates on providing increasing resilience against false alarms, so infrared technologies are also proving significantly more capable than optical detectors in picking up fast flaming fires in delivering equivalent performance to earlier ion detectors. So, in the case of those manufacturers developing dual frequency or dual angle optical detectors, for example, though a step forward these do not provide the true replacement provided by an infrared solution.

Thus, from the perspective of both earlier fire detection and minimising false alarms, the concept of multi-criteria detection has established itself as a mainstream technology response.

Key applications

Having said that multi-criteria detectors are moving centre-stage, two caveats should be introduced at this point. First, as a relatively expensive solution, full multi-criteria protection is ideally suited to those applications where the cost of downtime to the business is especially significant.

In such situations, though the early detection capability of a multi-criteria solution is valuable, resilience against false alarms is likely to be the determining factor from a commercial perspective.

Thus, multi-criteria protection is ideally geared for use in such environments as hotels who offer refunds in the case of evacuations for false alarms, financial institutions undertaking large volumes of high value transactions or mission-critical areas within airports, for example. At the same time, it is well-suited to sports and leisure industry applications, where there are often large numbers of people in a single location.

Similarly, multi-criteria protection is an example of general application, so will not be suited to other areas where the cost of downtime is significant, such as industrial processes which use chemicals that become airborne and can be aggressive to plastics or environments where major temperature variation is commonplace, which continue to require specialist detectors.

Yet as in any newly emerging technology, as the cost of multi-criteria devices comes down and the differential with traditional fire detection solutions narrows, so their applicability will inevitability become broader. IFP

The Need for High Performance Low Viscosity Alcohol Resistant Foams

By Jan Knappert

International Sales Director,
Dr Sthamer – Hamburg

The continuing development of fuels and alcohol based fuel additives to enhance performance and fuel efficiency, have given fire fighting foam manufacturers challenges to provide fast and effective extinguishing properties whilst maintaining an environmentally responsible and cost effective product offering.

With the development of alcohol resistant foams in the late eighties and early nineties, alcohols and alcohol additives for petrol risks, were not able to be protected, formerly fires involving alcohol containing fuels could not be effectively combated with the fire fighting foams of the day, as the alcohols in the fuels would absorb the water in the bubble wall and thereby destroying the foam blanket. These alcohol resistant foams have a polysaccharide polymer additive, which when discharged onto a liquid fire forms a thick blanket above the fuel, cutting off the oxygen supply and minimising the vaporisation of the fuel, this foam blanket would then breakdown slowly enabling the liquid released to maintain the film layer and aid cooling, while inhibiting the polar fuel from destroying the foam blanket. The major benefit of these alcohol resistant fire fighting foams is also their major drawback, these foams have a high viscosity (they are also known as Thixotropic or Non-Newtonian Liquids), which makes the foams difficult to pump long distances especially in colder climates. Foam hardware system designers and integrators have had to allow for larger bore displacement pumps and larger diameter piping networks.

The ongoing development of high performance "Low Viscosity" alcohol resistant foams with induction rates of 3x3, 1x3 and most recently 1x1 foams (the first number indicates the induction rate for Hydrocarbon risks and the second number indicates the induction rate for alcohol risks). These foams have a viscosity in line with the traditional AFFF's (see table below) as they do not contain polysaccharides but special synthetic polymer film forming foam stabilisers.

Test work carried out to EN1568 pt3 and pt4 by independent certification bodies have confirmed that these low viscosity foams are extremely effective in fighting large scale "Class B" liquid fires of both polar and non-polar fuels using freshwater, brackish water, treated industrial water and seawater without detriment to their performance.

The development of the new low viscosity 1x1 alcohol resistant foam, enables foam storage tank volumes to be reduced thereby additional savings can be made in the capital investment costs of new foam systems.

These low viscosity foams are true universal foam concentrates and can be effectively used for all traditional Low and Medium Expansion applications, therefore, they can be used for Monitor/ Water cannons and traditional fixed installations ie Foam Chamber, Over the Top pourers, sprinkler and deluge systems as well as manually controlled branch pipes.

Low viscosity foams are able to be freeze protected down to levels –25°C where the traditional

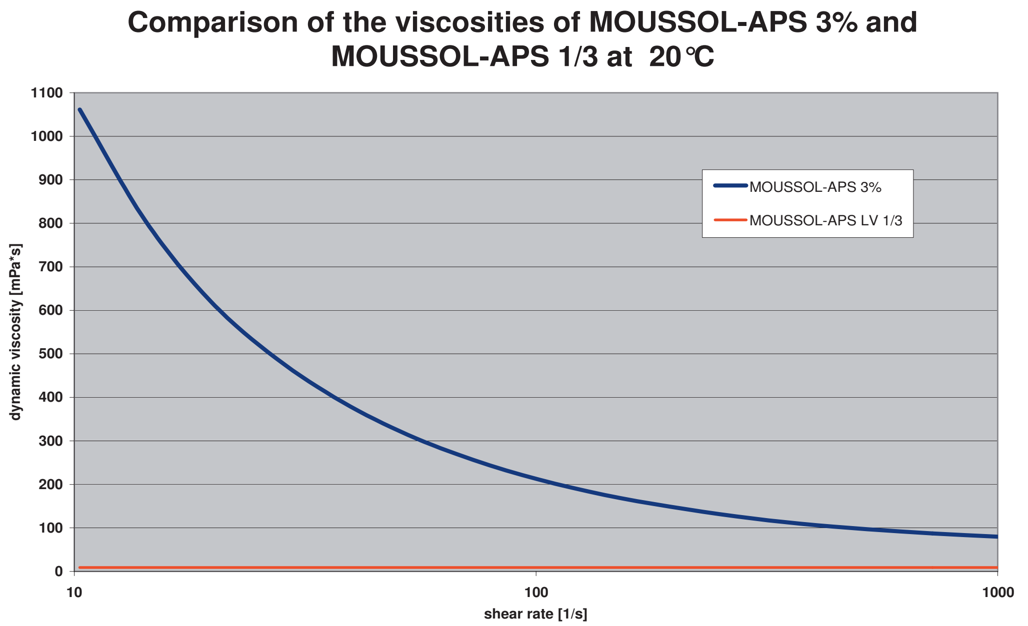
Temperature/Viscosity Table

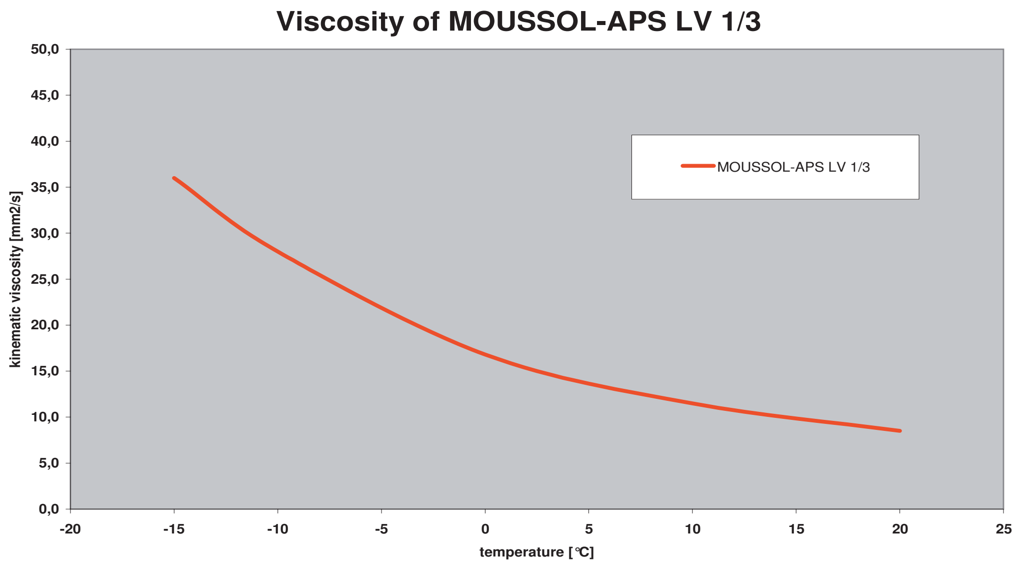
	3x3	3x3 LV	1x3	1x3 LV	1x1 LV
Temp.	Moussol APS	Moussol APS	Moussol APS	Moussol APS	Moussol APS
20°C	250	10	300	15	50
0°C	300	20	400	25	150
–10°C	400	—	—	—	—
–15°C	—	40	1000	45	450
–20°C	—	—	—	—	650
–25°C	—	—	—	—	900

Viscosity is measured in mPa at shear speed of $75s^{-1}$.

alcohol resistant foams could not be used without extremely large displacement pumps sets, whereas low viscosity foams only require centrifugal pumps. (See curves below).

Major end users, like refineries and tank farms, are faced with major cost penalties on the foam delivery hardware when upgrading their facilities, which is now very topical with the significant investment into the production and storage facilities for the new ethanol and Bio-Ethanol fuels. One recent project involved onsite discussions on upgrading the foam hardware system facilities, the existing foam concentrate was traditional AFFF foam, the customer was faced with upgrading the pipe work, pump sets and housing the foam storage tanks within a heated building. On carrying





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out a full site evaluation and flow test and fire tests, the customer opted for low viscosity alcohol resistant foam, and retained the existing foam hardware infrastructure, thereby saving tens of thousands of dollars.

Offshore platforms, FSO's (Floating Storage Offloading) Vessels and FPSO's (Floating Production Storage Offloading) Vessels face similar problems but are subject to even more extreme weather and temperature variances, and must be almost self sufficient in the event of a fire incident until help can be summoned from the support vessels. The fire fighting foams employed in these situations are needed to protect not only the decks, but the process modules, Helidecks and the deck storage areas. Previously several different foam types may have been be employed and stored on board requiring different application

Major end users, like refineries and tank farms, are faced with major cost penalties on the foam delivery hardware when upgrading their facilities.

methodologies and foam skids. The development of truly universal low viscosity Alcohol Resistant foams means all of the risk areas are protected with one foam type stored in either localised pods/foam skids or centralised atmospheric storage tanks of either GRP or Stainless steel with the necessary delivery system hardware.

As with all major industrial and petrochemical plants detailed risk assessments need to be carried out by qualified professional fire engineers in co-operation with the process system design engineers and end user clients, to ensure that every foreseeable potential fire risk scenario has been examined and protected against, using not only tried and tested technologies but including innovative state of the art technological developments. This can lead to significant cost saving possibilities without detriment to the emergency fire plans when sound engineering disciplines are employed. IFP

A Timely Wak

ASFP
ASSOCIATION FOR SPECIALIST FIRE PROTECTION

The sound of a distant alarm drifts into the conscious mind, and as you begin to recognise its not so dulcet tones, you realise that a new day is about to welcome you.

By Wilf Butcher

Chief Executive Officer, Association for Specialist Fire Protection

Your alarm (now at full volume) is telling you that it is 6.30am and time to start the day. The natural reaction of course, is to hit the snooze button and gain that all important extra five minutes. But as you gently fall back into slumber the alarm repeats its message all over again, only this time the volume appears almost deafening. A few seconds later the reality dawns; this is no wake-up call, it's a fire alarm and its message is a clear one! And so it was that I found myself in a hotel in the North of England one bright and sunny morning in early August.

For those of us that travel extensively for a living, the first thought to run through one's head is; where am I?

My next thought, perhaps for peace of mind, was that this was almost certainly going to be a false alarm, (this having not been the first occasion I have had to vacate a hotel for the same reason!). So, why rush?

The reason is simple. Having spent more than thirty years in the fire protection industry, I am only too aware of the reality of smoke and fire spread and just how those first few minutes in the early life of a fire are important in a real fire scenario to vacate the building. So common sense took charge and I very quickly dressed and vacated the room.

On my journey along the corridor to the stairs I was greeted by other hotel guests; some confused, some angry but no one unduly concerned. All gathered at their hotel room doors debating with each other whether it was a false alarm and what should they do. In my most authoritative tone, I announced to all concerned that they should vacate the building straight away down the nearest fire exit stairs and not to use the lift.

To my bewilderment, each man, woman and child ceased debating the matter and in true Pied Piper of Hamelin fashion followed me down the stairs and out (via the clear direction of the hotel

Having spent more than thirty years in the fire protection industry, I am only too aware of the reality of smoke and fire spread and just how those first few minutes in the early life of a fire are important in a real fire scenario to vacate the building. So common sense took charge and I very quickly dressed and vacated the room.

e Up Call

staff) to the muster point in the car park. The fire brigade were on the scene in a matter of minutes and the hotel set about the task of marrying names with hotel rooms.

As the minutes ticked by, people somewhat apathetically continued to appear in the car park and I began to ask myself the question; at what point might they have got into difficulties had this in fact been a real fire? Ten minutes? Twenty minutes?

The Building Regulations are specifically designed to ensure that any fire protection measure installed in a building will ensure the safe evacuation of those within in a timely fashion. But what happens when, for whatever reason, people are physically unable or simply decide that there is no rush to leave the building? In the event of an actual fire the answer is all too clear. They run a real risk of becoming a victim.

It therefore falls upon the shoulders of all those responsible for the design and construction of a building to ensure that the fire protective measures, products and systems installed are fit for purpose and those responsible for the onward maintenance of the building that all fire protective measures remain **continuously** fit for purpose.

In the case of many elements that go to make up the fire protective measures within a building, a false alarm can quite clearly demonstrate the effectiveness of the measure involved, for example the automatic closure of a fire door. However, many fire protective measures cannot be tested by a false alarm – the fire stopping measures installed between adjacent compartments of the building, or the structural fire protection installed or applied to the buildings structural framework, are just two examples.

Such passive fire protective measures are absolutely essential to the control of a fire, but no matter how many false alarms a building may be subjected to, it is only when there is an actual fire that the effectiveness of such fire protective measures can be determined.

Under the Regulatory Reform (Fire Safety) Order 2005, introduced October 2006, all hotels along with other business premises are required to carry out fire risk assessments to ensure that all their procedures are effective in the event of a fire and that the fabric of the building is adequately protected to ensure safe evacuation.

Within the lifetime of a building many changes can take place. Openings in compartment walls may be required to make way for new cabling, piping or ducting to pass through, walls moved and extensions added. In all of these cases, appropriate measures must be taken by those with the essential expertise to ensure that any existing passive fire protection measures are maintained and all new measures installed are in accord with the required regulations and standards.

In the case of many fire protection measures there can be no practice runs. It has to be right first time, irrespective of when. It therefore follows that all those involved in the design, construction and onward maintenance of a building must ensure that:

- The products, systems and materials chosen do comply with the relevant standard and are appropriate to the situation at hand
- Such fire protective measures are applied or installed by third party certificated installation companies
- Any risk assessment takes account of ***all*** the fire protective measures within a building.

The ability, or willingness, of any individual to vacate a building in a timely fashion can never be guaranteed. Statements such as "I must send this e-mail, it's important", "I just need to finish this phone call", "It's bound to be a false alarm", are not uncommon.

After all, for the majority of us, we see smoke and fire as something we view from a safe distance rather than becoming an unfortunate part of. It is only when placed in such catastrophic circumstances that the realisation of the potential seriousness of the situation focuses the mind and the need to vacate the building becomes paramount.

Sadly two weeks after my early morning wake-up call, a fire swept through a hotel in Newquay resulting in the tragic loss of life. When it comes to real fires there is never a happy ending! IFP

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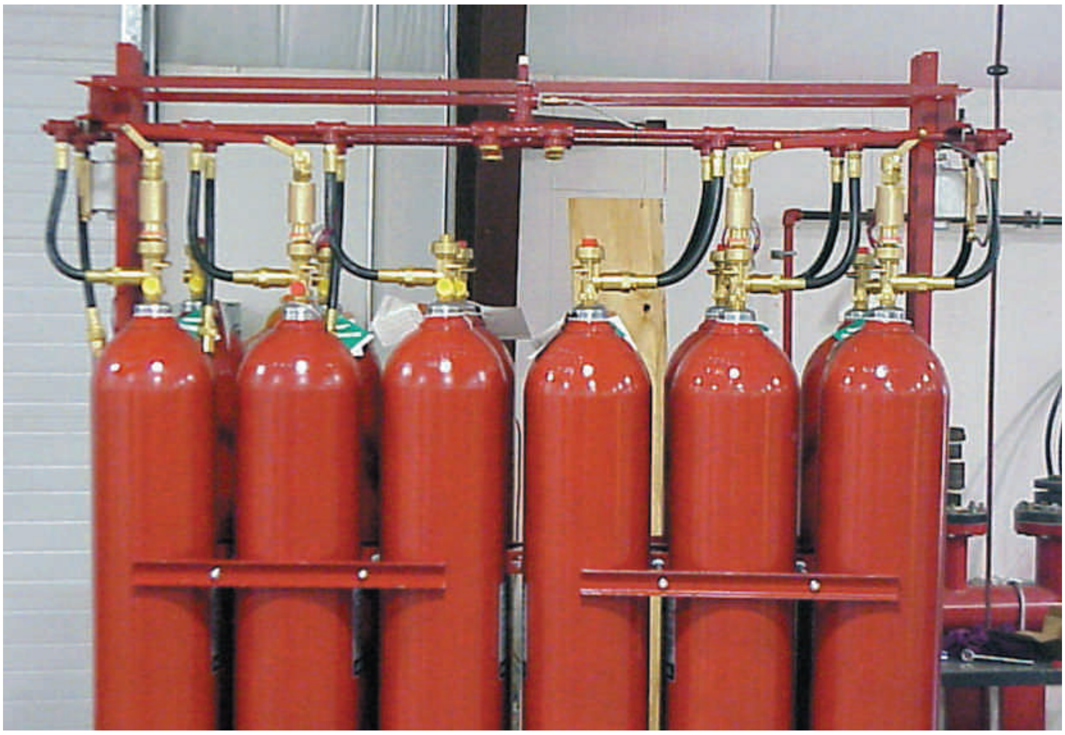
Telomerization:
Area per polar head
Gibbs equation
Nucleophilic substitution
Hydrophilic
Hydrophobic
oleophobic
Area per polar head
hydrocarbon solvent
infinite cylinder of liquid

Pic courtesy of Tyco Safety Products Fire Suppression Group



CO_2 Provides Versatile Protection for Computer Suites

With Carbon Dioxide fire suppression having been around for over 90 years, you might think that there is nothing left to say, and nothing new. Not so says John Allen, EMEA Marketing Director for Tyco Safety Products Fire Suppression Group. Here he overviews two recent developments that were first shown at the recent International Firex exhibition in the UK.

By John Allen

EMEA Marketing Director, Tyco Safety Products Fire Suppression Group

Carbon Dioxide seems to find its way into every newscast these days, thanks to the role that is attributed to it in terms of its impact on global warming. This focus has inevitably led to a considerable amount of misunderstanding about CO_2 and its role as a firefighting agent.

CO_2 is a gas that occurs naturally in the atmosphere. That used as a firefighting suppressant is extracted from a number of normal CO_2 producing processes, and is then stored until it is needed. So, its use in fire suppression systems results in a net removal of CO_2 from the environment. In all probability, it has safely extinguished more fires than any other gaseous suppressant agent. However, its use in fire protection is insignificant compared with the potential damage caused by an uncontrolled fire or the large quantities of CO_2 emitted as a by-product of many industrial processes.

So it is hardly surprising that it continues to be a popular and versatile choice for both total flooding of enclosed areas and local discharge for Class A, Class B and Class C fires. When discharged, it leaves nothing behind to damage sensitive electronic equipment or documents, and with no agent clean-up required, business critical installations can be back in operation in the shortest possible time. Similarly, priceless manuscripts do not have to be subjected to years of painstaking and expensive restoration work.

While it is not suitable for total flooding applications in normally occupied rooms or enclosures, as the discharge of CO_2 in fire extinguishing

Pic courtesy of Tyco Safety Products Fire Suppression Group

concentrations represents a serious health hazard to people, it is an ideal solution when seeking protection for unoccupied areas. Typically, these include unmanned computer suites, telecommunications centres, control equipment rooms and plant rooms.

An essential consideration though is to ensure that the flooded areas are adequately ventilated after discharge of the CO_2 to prevent accidental exposure of personnel to dangerous levels of CO_2

CO_2 expands at a ratio of 450 to 1 by volume. It has excellent thermal stability, and freedom from deterioration.

when investigating the cause of the discharge. Because it is one-and- a-half times heavier than air, CO_2 tends to collect at low level and in under-floor ducts.

CO_2 expands at a ratio of 450 to 1 by volume. It has excellent thermal stability, and freedom from deterioration. Additionally, as CO_2 has so many other commercial uses, refills are readily available throughout the world.

One particularly attractive feature of CO_2 is that it can be compressed into a liquid state which, when maintained under pressure, requires a smaller storage footprint than many other gaseous suppression agents. This can be of particular importance to city-centre-based organisation, where rental costs mean that available floor space if frequently limited. Another factor in CO_2's favour is its low cost in comparison with many alternative suppression agents.

New fixed total flooding system

This unique collection of end-user benefits encouraged Tyco to further invest in CO_2 delivery technology, which resulted in the recent unveiling of a new low-cost HYGOOD® CO_2 high pressure system at International Fire Expo in Birmingham in the UK. The new system incorporates the latest cylinder, valve and nozzle design enhancements, and easy integration with the latest fire detection and alarm systems.

It is an engineered system that uses individual premium-build steel storage cylinders of 16kg, 23kg, 34kg and 45kg capacity that can be manifold-linked together to enable rapid, simultaneous discharge. The gas is stored under pressure and is piped to the protected enclosure, where it is released via a network of piping and strategically

located discharge nozzles, the position and type of which have been determined by the system design. The cylinder valves can be opened automatically – either locally or remotely – or manually using pneumatic, electric or mechanical valve actuators, and two or more hazard areas can be protected with a single group of cylinders by means of directional or selector valves.

On release, the colourless, odourless, electrically non-conductive, and non-corrosive gas permeates the entire protected area and extinguishes the fire, mainly by reducing the oxygen level to less than the 15 percent necessary to allow combustion to take place. The gas also provides localised cooling.

In addition to protecting the main suite itself, the system is also equally effective protecting the spaces beneath raised floors that are commonly used in computer and switchroom enclosures to house the extensive cabling. These areas can be as much of a fire hazard as the equipment in the suite itself, because, if a fire occurs, locating and controlling the outbreak before it can cause serious damage is essential, although not easy achieved. It is an application where CO_2 has proven to be very effective. It is another instance where, as no clean-up is required, CO_2 enables the facility to be in operation in the shortest possible time after the fire has been extinguished.

Local discharge

Of course, not all IT equipment is housed in an enclosure. This may be because the particular piece of equipment has to be easily relocatable, or because it needs to be integrated with other pieces of equipment on a production or process line. In such cases, total flooding is often not an option; portable extinguishers are frequently the only workable solution.

CO_2 remains an effective, versatile and cost-effective fire suppressant for fixed total flooding applications and for localised portable firefighting.

While CO_2 is an eminently suitable suppressant, continuing worries about the quality of many portables coming onto the market is concerning many users anxious to ensure that their IT equipment is being properly protected. The reality is that, while these individual items of IT equipment may not be housed in a suite enclosure, they may nevertheless be of critical importance to maintaining production.

Such concerns inspired Tyco to develop a new range of premium-build portables, which includes CO_2 extinguishers. These are now available in the UK under the TOTAL® brand and elsewhere under the NEURUPPIN® brand.

Generally, these new portables are manufactured from specially formulated steel that remains flexible after heating and welding. They also have a one-millimetre-thick internal powder coating that is widely recognised as the industry's most hardwearing surface, providing the best corrosion resistance. Each and every cylinder is electrode-tested to ensure there are no pin-point

Pic courtesy of Tyco Safety Products Fire Suppression Group

flaws in the internal coating, and the quality of the external finish can be judged by the fact that there is a complete absence of colour fading, which is a common feature of many inferior quality cylinders. Each and every cylinder is uniquely numbered to provide a complete and reliable quality audit trail.

The TOTAL and NEURUPPIN CO_2 portables are, however also available in aluminium, which makes them very lightweight and easy to handle. It also ensures excellent corrosion protection. Two models are available – 2kg and 5kg – and the 2kg portable incorporates a special double-wall horn that protects the user's hand from freezing. It also has an extremely high fire rating of 55B, which enhances the portable's safety margin. These ratings are a measure of the ability of a fire extinguisher to fight a fire of a certain size, and the larger the number in the fire rating, the bigger the fire on which the extinguisher has been tested. The letter "B" shows that the extinguisher is suitable for use on Class B fires.

Another CO_2 portable in the new TOTAL and NEURUPPIN line-ups is an antimagnetic extinguisher that was specially developed for locations where magnetic interference could potentially damage sensitive electrical equipment or put equipment performance in doubt or at risk. It too is suitable for Class B fires, and is constructed entirely from non-magnetic materials.

So, CO_2 remains an effective, versatile and cost-effective fire suppressant for fixed total flooding applications and for localised portable firefighting. While build quality of the systems and the application of health safeguards are essential, properly designed and correctly maintained, CO_2 is an excellent fire suppression agent that can play a major role in protecting vital business assets. IFP

Sprinklers in

Pic courtesy of European Fire Sprinkler Network

Warehouses are one of the most vulnerable buildings to large fires. This is because for operational reasons there is pressure not to introduce internal compartments and so there is nothing to prevent fire from spreading throughout a building. Moreover today's warehouses are much larger than those built in the early part of last century. They are also higher, using racked storage layouts, and often carry goods of a much higher value (consider a pallet of mobile phones against a bale of cotton). Readers who have never seen a fire test on a warehouse mock-up are likely to be surprised at the speed of fire spread: it can take less than a minute for a fire to go from ground level to large flames above seven levels of racks.

By Alan Brinson

European Fire Sprinkler Network

Legislative requirements to fit sprinklers

Fire safety regulators in a number of countries recognised the vulnerability of warehouses to fire and introduced maximum compartment sizes, above which warehouses must be sprinklered. The requirements to fit sprinklers have three aims: firstly to prevent fire-fighter exposure to excessive risks; secondly to limit fire-related emissions and thirdly to protect the local economy.

Regarding fire-fighter risk the authorities in The Netherlands and Germany have determined that a single fire crew can cope with a fire no larger than 1,000m^2 and 1,200m^2 respectively. It is therefore not acceptable to design buildings which could present the first responding crew with a larger fire. Although the fire service could decide not to enter the building they may do so if on arriving they are told that people may be or still are in the building. Thus in The Netherlands if a compartment (in any building) is to be larger than 1,000m^2, additional fire safety measures are needed to demonstrate equivalence to 1,000m^2 compartmentation[i]. In most cases and in almost all warehouses the solution is to fit sprinklers. For the same reasons in Germany the local state building code[ii] requires sprinklers. That fire-fighters are likely to risk their lives in a fire in a large warehouse was sadly proven when in June nine fire-fighters lost their lives in a fire in a furniture warehouse in Charleston, South Carolina USA. Preliminary computer simulations of the fire development indicate that it spread faster than running speed, so that some fire-fighters were caught by surprise. Others probably died when the roof collapsed. Roof collapse is a common fire-fighter concern in warehouse fires.

France experienced some large warehouse fires which took days to extinguish and therefore introduced a requirement[iii] to fit sprinklers in warehouses larger than 3,000m^2. The Spanish building code[iv] explicitly includes the protection of property

Warehouses

as one of its purposes and therefore has detailed requirements to fit sprinklers in warehouses; depending on the fire load and adjacency to other buildings sprinklers can be required in warehouses as small as 300m^2, although for most applications the threshold is 2,000m^2. Across Europe Austria, Denmark, France, Germany, Netherlands, Norway, Portugal and Spain all have requirements to fit sprinklers in large single storey warehouses, with threshold areas ranging from 1,000-3,000m^2.

By contrast the new edition of Approved Document B[v], which took effect in England and Wales in April 2007, for the first time introduced a threshold of 20,000m^2, an order of magnitude larger than in other European countries. Unlike in Spain the scope of Approved Document B does not include property protection, and in the absence of major loss of life in warehouse fires the regulator felt unable to introduce a requirement to protect warehouses with sprinklers. Nevertheless one could ask whether it is reasonable to allow the construction of buildings which could present fire-fighters with an impossible challenge.

Although Approved Document B does not consider property protection, the Government did commission a brief study to determine whether there is an economic case to fit sprinklers in warehouses[vi]. This study was hampered by a lack of data and relied heavily on warehouse loss data per square metre for 1966 warehouse fires shown in a graph in the de facto British fire engineering standard, PD-7974-7[vii]. While nobody could reproach the researchers for using the only available standard, one could question the usefulness of loss data in 1966 currency and any conclusions drawn from it. Warehouses built before 1966 were usually lower in height and smaller in area than those of today, often contained goods of lower specific value and were built very differently. Furthermore the standard does not indicate how to index the 1966 losses to today's currency: should one use the retail price index, London house prices, or some other arbitrary index? Using the retail price index, the researchers could not find an economic case to fit sprinklers in warehouses of any size, a conclusion which has astonished insurers. Doubling the losses per square metre yielded a threshold of 19,000m^2, which intriguingly is close to the new figure of 20,000m^2 in Approved Document B. Had the researchers doubled the loss figure again, the threshold would have come out below 1,000m^2. While not an exhaustive study, I have determined the value of goods per square meter in a few warehouses and using the same methodology found a threshold figure of 2,000m^2, above which there would be an economic case to fit sprinklers. None of the above discussion considers the losses due to business interruption, which can be substantial.

The good news is that while most of the UK lags behind the rest of Europe in requiring sprinklers in warehouses, Local Acts which cover a quarter of England and Wales do require sprinklers in warehouses, typically those larger than 7,000m^3, to protect fire-fighters and property. Many in the fire safety community believe the remit of Approved Document B should also be extended to consider protection of the environment and our economy: sustainable buildings for sustainable communities. It is absurd that under the current regime a tyre warehouse fire which closes transport links and pollutes a river can be regarded as a success if nobody is hurt.

Pic courtesy of European Fire Sprinkler Network

New Sprinklers for Warehouses

Although the sprinkler concept is old it is continually being refined, either to find ways to protect risks that could not previously be protected or to find more economic sprinkler solutions. Every year considerable sums are spent on research and

Pic courtesy of European Fire Sprinkler Network

Pic courtesy of European Fire Sprinkler Network

storage sprinkler systems have received among the most attention. Recently the industry has developed new solutions for the protection of high-piled storage, for the protection of refrigerated warehouses and for the protection of tyre storage.

In general the sprinklers used for storage applications can be divided into two broad groups: control mode sprinklers and suppression mode sprinklers. Control mode sprinklers are designed to limit the heat release rate of a fire to the level it was at when the sprinklers operated. They wet adjacent surfaces and cool the gases so that the ceiling structure is not weakened. The hydraulic characteristic of a sprinkler is defined by its k-factor. Multiply the k-factor by the square root of the pressure in bar and you have the flow rate through it. K-factors of control mode sprinklers now range from 80 to 240, in upright or pendent options. Generally designers prefer upright sprinklers in warehouses because they are protected by the pipe from damage.

The goods stored in a warehouse determine its hazard category and that in turn determines how much water per square meter, or the application density, the designer must apply for hydraulic calculations. In addition for higher hazard categories the standard requires the designer to assume a greater area of operation, or more sprinklers operating. To avoid excessive pressure requirements at the sprinkler the designer can use sprinklers with higher k-factors. It is in any case good practice to avoid high pressure at the sprinkler because it will then spray small water droplets which are carried away by the fire plume and do not penetrate

Pic courtesy of European Fire Sprinkler Network

down to the seat of the fire. The largest k-factor sprinklers have not been submitted to LPCB for approval but they do carry FM approval and UL listing. To obtain these approvals they were tested in full-scale fire tests and had to perform as well as the reference, approved, smaller k-factor sprinklers. They actually performed much better. For example, in a test with NFPA Group A plastics with a design application density of 24.3 mm/min, k-115 sprinklers controlled the fire but 29 sprinklers operated. By contrast k-160 sprinklers controlled the fire operating only 4 sprinklers. Ceiling temperatures peaked at 900°C with the k-115 sprinklers but at 300°C with the k-160 sprinklers.

At the request of end users, in recent years the sprinkler industry has introduced extended coverage control mode sprinklers. These have a k-factor of 360 and can protect 18.2m^2, or twice the area of other control mode storage sprinklers. That means that the designer can often save one-third of the branch lines, thus considerably reducing the cost of the installed system.

Unlike control mode sprinklers, which prevent an increase in the heat release rate from a fire, suppression mode sprinklers reduce the heat release rate. Suppression mode sprinkler systems are designed to operate fewer sprinklers but each sprinkler releases more water, with larger water droplets and at a higher downward velocity. The most common type of suppression mode sprinkler is the Early Suppression Fast Response, or ESFR sprinkler. These sprinklers suppress fires solely from the ceiling; saving the cost of fitting sprinklers between rack levels and removing the risk of water damage from in-rack sprinklers should a forklift truck driver hit one. ESFR sprinklers range in k-factor from 200 to 360. Most are approved by LPCB, with the larger k-factor ESFR sprinklers being able to protect one more level of racks than the others.

Last year two manufacturers introduced new concepts for the protection of refrigerated warehouses. One uses ESFR sprinklers with a special anti-freeze, the other a dry pipe system calculated to release water within 30 seconds.

At the request of the tyre industry, the same two sprinkler manufacturers developed new sprinkler designs which use low expansion foam to protect tyres stored in racks. These systems use much less water than water-only systems, saving on pump, tank, piping and any water retention system costs.

Storage sprinkler systems offer more alternative designs than any other application. With careful selection of the design concept and sprinklers the designer can achieve significant savings against the usual approach with sprinklers that have been on the market for decades. While warehouse fires cause relatively few fire deaths and injuries, they often lead to large property losses and disruption to businesses, harming communities with the loss, sometimes permanent, of a major local employer. Fire-fighters agree that an uncontrolled warehouse fire is one of the most dangerous scenarios they are likely to face. For all these reasons, many European countries now insist that sprinklers be fitted in large warehouses. It is time the UK joined them. IFP

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Pic courtesy of RJA Group

Challenges to the designer:

Exiting from high-rise & large mixed-use buildings

High-rise and large mixed-use buildings are located throughout the world. These facilities have the potential to contain a tremendous amount of occupants, especially gaming resorts. Finding a way to egress building occupants in an emergency can be a challenge depending on the complexity of the facility and the uses within the complex. When multiple uses come together in one of these facilities, the exiting challenges can grow exponentially. These facilities are sometimes referred to as "Mega Resorts".

By Virginia Charter and Jeff Grove

RJA Group, Inc.

Typically designed around a casino and hotel premise, Mega Resorts have developed to include all the amenities a consumer could imagine within one facility. Obviously, this is intended to keep occupants at the same place to maximize revenue (e.g., gaming, entertainment, retail, restaurants, etc.).

Las Vegas, Nevada and Macau, China are two such destinations that have taken the concept of the Mega Resort to new levels. Although Las Vegas has been a part of the resort industry for over fifty years, ideas for larger and more encompassing resorts to replace those previously in operation has been the norm over the past twenty years. These facilities are attracting tourists by the millions each year. Macau is relatively new to the resort industry, but has not suffered for lost time and is predicted to be just as glamorous and stimulating as Las Vegas.

Dubai, located in the United Arab Emirates, has also recently entered the construction of extremely tall and large facilities. Although not associated with gaming, the facilities in Dubai do not lack in size or substance. However, these facilities also present significant challenges to the designer to determine how to address a satisfactory means of egress.

The layout of the Mega Resort typically includes a parking structure, podium levels, and residential high rise towers. The podium levels are typically arranged to house the amenities for the public. Whether it be theaters to attend Broadway style

Pic courtesy of RJA Group

productions, a retail complex that would rival any local mall, an expansive pool, multiple restaurants and nightclubs, or a wedding chapel; these uses, that by themselves could pose unique egress concerns, have been incorporated within these mega facilities to push the limits of the egress system. The number of podium levels varies from resort to resort and is generally between one to five levels. The hotel tower provides thousands of rooms and suites for overnight guests.

Challenges

Typically, the larger the resort, the greater the challenges presented for life safety related systems within the facility. Each facility competes with its predecessors to have a more elaborate theater, a larger convention center, a more expansive casino floor, taller residential tower accommodations, unique shopping opportunities, varied dining experiences, and amenities to better a patron's overall experience and entice future visitors. Tower heights, large occupant loads, multiple uses, proximity to property lines, paths for exit discharge, common path of travel, and travel distances are common challenges for these resorts.

Within every large facility there are multiple high-rise stairs serving the hotel tower, levels of the podium, and the parking garage.

These resorts contain just about everything a city does. Almost all the major occupancies called out in the International Building Code (IBC) are in these facilities. In addition to the amenities provided to patrons (gaming, shopping, dining, etc.), there are just as many back-of-house support areas. Many times these areas are even located on intermediate levels that patrons do not even know exist. These support areas often include offices, mechanical and electrical rooms, storage, kitchens, and loading docks. On occasion, these back-of-house areas can also include hazardous occupancies, such as fuel for emergency generators and fire pumps, bulk pool chemical storage, etc. Because of the multiple occupancies located within the resorts, additional challenges come with these mini-cities. Occupancy separations, high security areas, the desire to keep the public out of unoccupied spaces, or employee only areas also add complexity to the egress design. Additionally, these massive properties are all contained within sites that can range from 20 to 70 acres. Compare this to a city whose high density could be spread over 10-square miles. Each resort is jammed packed into these sites and the building or buildings can also approach adjacent property lines. Space within these facilities is at a premium and exiting is not always the initial focus of the designers.

Sometimes coinciding with these mega resorts and other times standing alone, it is common practice to have residential or office high rise towers in excess of 500 feet. Sometimes these facilities reach more than 1,000 feet above grade. These heights lead to new challenges in exiting.

Within every large facility there are multiple high-rise stairs serving the hotel tower, levels of the podium, and the parking garage. Many of these stairs face the challenge of exit discharge due to their location within the facility. Many of these stairs are not located on the exterior portion of the facility. As such, these stair terminations reside in the middle of the resort. Once occupants achieve a level of protection (i.e. a two hour exit enclosure), that level of protection or greater must be provided to the exterior of the building. Through the use of intermediate levels, horizontal stair transfers may be added to avoid having a two hour enclosure running through the main podium levels.

With facilities of this magnitude, exits need to be distributed evenly. The IBC limits the maximum distance an occupant is allowed to travel before reaching an exit, as well as the maximum common path of travel. Typically the main podium levels of large resorts stretch well over 1,000 feet in one dimension. Now, not only is capacity an issue with exits, additional exits need to be provided and placed to address maximum travel distances. Maximum travel distances are quantified within the IBC based upon the occupancy group, and whether automatic sprinkler protection is provided. For most occupancies within these fully sprinkler facilities, the maximum travel distance from any point to the closest exit is 250-feet.

Another component of the means of egress

system is the limitation of the maximum common path of travel. Common path of travel is defined in the IBC to be "that portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available." Common path of travel challenges within these facilities typically occur in back-of-house areas and large residential units. Rooms or spaces that may require only a single exit due to a limited occupant load would require a second exit if the common path of travel was exceeded.

The maximum occupancy for these facilities rivals the total population of many cities. For example, the average new gaming facilities must accommodate anywhere between 70,000 to 100,000 occupants worth of egress capacity, with some of the larger facilities approaching over 250,000. This is due to not only these facilities being very large, but also the IBC requirement that all portions of the building be considered to be occupied simultaneously. Large occupant loads are a major concern for the egress systems within these Mega Resorts, since available floor space needs to include exits. Space within these resorts is at a premium and the location of these exits is a critical balance. Additionally, the largest of these occupant loads are not always located at grade level. As a result, there could be 20,000 to 40,000 occupants on each of the podium levels. These loads could account for up to 750 feet of exit width. This is a considerable amount of space when trying to maximize revenue generating space within a building. It has also become common practice to put large assembly uses at the top of residential towers, such as night clubs, restaurants, pool decks, etc. This issue results in larger exit stairs that potentially take away from guest rooms, condominium units, or even leased areas on lower tower and podium levels.

Solutions

There are several solutions that can be used to alleviate the impact on exit width for these facilities. These solutions may all need to be used depending on the level or sometimes only one will resolve the exiting issues. Two examples of pre-scriptive code compliance that may address exiting challenges include scissor stairs and horizontal exits. A third solution to improve the impact on exit capacity, when allowed by the local authority, is separate evacuation zones. There are two additional solutions for high rise buildings to aid in the evacuation occupants. These solutions include the use of area of refuge floors or the use of elevators in full building evacuations. Some facilities may require both.

Scissor stairs are a great way to add to the capacity of an exit without significantly increasing the width. Each scissor stair will have two separate entrances with two separate sets of treads that criss-cross each other. However, it is important to remember, that scissor stairs can only add to the capacity of an exit. Even though there are two separate entrances into this stair, it can only be considered as one exit since they are essentially within one stair shaft. It should be noted that some international codes recognize double helix stairs as separate exits. These are similar to scissor stairs in that the two sets of treads criss-cross each other. The difference is that each set of stair treads, landings and stair entrances are separated from each other by two-hour construction. Although explicitly not permitted by the IBC, this means of stair construction has been utilized successfully in several areas of the world to

Jin Mao building in Shanghai, PR China. Picture courtesy of Rolf Jensen & Associates

Pic courtesy of Jalite plc

address required additional exits.

Horizontal exits are another solution that can be utilized to approximately double the number of exits and the amount of exit capacity without a need for additional stairs. Since up to 50 percent of the number of exits and capacity can be configured with horizontal exits, this can help reduce stair widths within the building. Horizontal exit walls are required to be continuous from the exterior wall to the exterior wall of a building creating a two hour fire resistive constructed separation between the two areas. Once occupants have crossed the two hour barrier, they are considered to have exited the area being evacuated. However, on the opposite side of the horizontal exit wall, a refuge area providing sufficient room for the exiting occupants, as well as the occupants already anticipated in that area. From the refuge area, occupants are required to be provided with a clear path either directly to the exterior or to a rated stair enclosure to take them to the exterior of the building. Horizontal exits are an effective means of egress for convention centers, ballrooms and theaters, as well as dividing casinos from other areas of the resort. These inherent architectural boundaries for these uses can then be effectively are utilized for horizontal exit purposes. For podium levels located at grade, the use of horizontal exits and multiple exterior exits is usually sufficient to meet the exiting needs.

When allowed by the local authority, a third solution that is typically used on high density podium levels is separate evacuation zones. Evacuation zones coincide with the fire alarm, sprinkler, and smoke control system boundaries and naturally utilize the horizontal exit walls as some of the boundaries. When using separate evacuation zones, the entire floor no longer exits at the same time. Occupants within one zone would exit, while the other zones would remain in normal mode. This way both exit stairs and horizontal exits can be used by multiple zones and in a sense utilizing the same exit capacity many times. Evacuation zones are a viable option because with these mega resorts the type of construction (Type IA or IB) is the most restrictive and in a sense each zone is enclosed by two hour rated construction. Using separate evacuation zones is an extension of the provisions allowed for a horizontal exiting scheme, since not all areas of the floor will be evacuated.

Due to the significant height of high rise towers, additional protective methods may be

considered and utilized for the overall exiting system. Although not a requirement within the IBC area of refuge floors are a means to allow occupants to gather and rest during an event within exceedingly tall high rise structures. Typically located every ten to thirty levels depending on the project and jurisdiction, refuge floors are either open to the atmosphere or completely enclosed. Refuge floors are of the same construction of the stair shaft that it serves and sized to allow for three square feet per person of the floor of alarm, floor above, and floor below since those would be the floors evacuated. Occupants can enter these levels only from the exit stair. These levels are used to have occupants gather for further instruction by trained personnel (either building management or fire rescue). These levels can also be used as a resting place for occupants because should they want to continue, occupants would re-enter the stair and continue down to the next refuge floor or to the building exterior.

Though it is not a new practice and not recognized by the IBC, the use of elevators for ambulatory evacuation is still being defined through different projects in the world depending upon the height and complexity of the facility. The most effective use of elevators for this type of evacuation is typically when the building as a whole needs to be evacuated. Should this be the case, through the use of the voice evacuation system, occupants would be instructed to meet on designated floors (by means of an exit stair) where elevators would pick occupants up and take them to the ground level. The elevators are on both normal and emergency power and are only used once the building and building systems affecting the elevators are deemed safe.

As an alternative to the prescriptive requirements of the building code, performance based solutions may also be utilized for numerous aspects of the required means of egress, including extended travel distances, and increased exit capacities. These solutions may include tenability analyses to determine the maximum amount of time occupants are provided with a tenable environment to exit the area under consideration. Timed egress analyses can then be computed to determine the maximum travel distances that occupants are permitted given this tenability analysis. Further, computer based models can also be utilized to determine if exit components can accommodate greater numbers of occupants, also based upon this tenability analysis. Of course, these solutions are also dependent upon the authority having jurisdiction being comfortable with the conclusions of these analyses.

Summary and conclusion

These Mega Resorts or high rise buildings can be overwhelming from a life safety aspect, especially the required means of egress systems. Breaking the facility down by levels and areas helps alleviate the prospect of having to exit an entire facility simultaneously, which can rival the size of small cities. It can be broken down into the same categories as above; high rise levels, garage, and podium. From there, each level may need to be further broken down and evaluated. Parking garages are usually the lesser challenging aspect of the facility followed by typical residential levels. However, the more challenging residential levels with larger guest suites or the upper levels containing high density occupancies (night clubs, pool decks, restaurants) as well as the podium levels will need to apply several of the solutions listed above.

Mega Resorts and high rises are the norm as desired destinations throughout the United States and the world. Exiting from these facilities is extremely challenging when dealing with so many factors, while trying to keep the design intent of the owner and architects in mind. Since floor space is at a premium, cost on the high density floors, creative solutions to exiting are almost always required. Through the use of multiple stairs/exits, scissor stairs, horizontal exits, separate evacuation zones, interior stair transfers, area of refuge floors, and elevator evacuation, these buildings can be designed efficiently to provide both entertainment and safe evacuation for those patrons. The ultimate design is to make the required exits augment the architectural design. IFP

Pic courtesy of E2S

Explosion proof or intrinsically safe alarm signalling in hazardous areas

Audible and visual signals are increasingly required to alert, inform and 'alarm' people, particularly where a potentially explosive atmosphere may exist under normal and or abnormal working conditions.

By John Rattlidge

E2S

Electrical and, latterly, electronic signaling devices have been around since the 1930s, originally defined as "explosion proof", devices housed in monstrous cast metal enclosures, capable of withstanding an internal ignition and subsequent explosion caused by an electrical spark and or internal heat build up without igniting the atmosphere within its immediate location. They were necessarily expensive and crude, but they were above all effective, typically used underground in mines. All were manufactured to the same code of practice; electrical devices for use in such environments were generally produced in two versions, for use either above or below ground. Their design appears strikingly 'over-engineered' by today's standards. The fundamental protection principle, the means of preventing an electrical spark of sufficient energy igniting the surrounding atmosphere of these early devices has not changed, and the much enhanced, regulated and standardised design is to be found in the modern day EEx d explosion proof device.

An alternative protection principle for electrical devices to be used in hazardous areas has evolved over the years. Instead of the containment approach, an alternative method prevents sufficient power being present at a potential source of ignition during fault conditions of the device so that it is intrinsically safe; the enclosure itself may offer little physical protection.

Today the manufacturer, installer and site owner face a plethora of increasingly stringent regulations and standards further complicated by legislation, international peculiarities, and directives. A consequence of this situation is that manufacturers endeavour to produce a super conformant

Pic courtesy of E2S

international product that will conform to all standards and directives in force in different parts of the world. However in the case of audible and visual devices it inevitably affects the overall performance of the primary function the generation of sound and light output.

Explosion proof EEx d products are suitable for environments where a potentially explosive atmosphere is likely to occur occasionally under normal operating conditions, known as a Category 2 product, suitable for Zone 1; in the USA – Division 1. Explosion proof audible and visual signals allows the installer to treat their design and fitting as similar to that of non hazardous area products; generally this means ensuring a certified cable gland is used together with the correct cable in terms of current rating and physical protection; typically, SWA MICC or a similarly rated cable will be required. The installation must be undertaken by a competent and suitably qualified person.

In general this concept allows for quite high powered and very loud sounders to be used, particularly useful in harsh demanding environments. Sounders allow for many different tones and stages of alarm permitting different alarm conditions to be indicated from one device. The addition of an increased safety terminal enclosure EEx e offers the installer the convenience of a separate termination avoiding the disassembly of the product and the use of a much more easily fitted and significantly less expensive certified gland during installation, reducing installation time by up to 50%.

Explosion proof beacons, traditionally Xenon tube technology but nowadays increasingly LED array offer high outputs, again with the option of an increased safety terminal enclosure EEx e. Some beacons allow for synchronized flashes with others in the same system to give a more intense and effective appearance and the more versatile LED beacons offer numerous different flash and steady output patterns. Combination beacon and sounder units offer a neater solution, combining the obvious advantage of both audible and visual signals from a single device with a reduction in installation time.

Intrinsic Safety is a system concept. Some users are put off by this idea, mistakenly believing that it is complicated and best left to the specialists – a 'black art', when in fact it is very straightforward, particularly when it comes to sounders and beacons. The intrinsically safe system consists of the field device, and the associated apparatus, Zener barrier or isolation interface. Intrinsically safe products are suitable for environments where a potentially explosive atmosphere is present continuously or for long periods under normal operating conditions, known as a Category 1 product, suitable for Zone 0; USA – Division 1. Intrinsically safe EEx a or EEx b sounders and beacons are primarily for use in low power systems, such as control and measurement as well as general alarm systems operating in hazardous environments. The protection concept is to limit the amount of current and voltage into the device through the use of a Zener barrier or galvanic isolator. In the event of a fault within the intrinsically safe device, insufficient energy will be available in terms of a spark or heat to ignite the potentially explosive atmosphere.

Intrinsically safe sounders and beacons require knowledge of the installation principles for them to be fitted. The actual fitting and wiring is more straight forward and quicker than explosion proof devices; they also tend to cost considerably less. However, due to the restriction in input power to less than 2 Watts, the output in terms of both light and sound is limited and in general is considerably less than the explosion proof alternatives. Typical installations would be control rooms, filling stations and areas requiring local alarm and status indication.

Intrinsically safe sounder and beacon products are typically small compact devices; recent developments allow multiple sounders, beacons or combined units to be operated from one barrier, giving a significant reduction in installation and equipment costs.

Products approved for use in Zone 0 and Zone 1 can also be installed in Zone 2, areas where a potentially explosive atmosphere is not likely to occur under normal operating conditions, but if it does, it will only be present for short periods.

A Category 3 product suitable for Zone 2 use, is rated EEx N, a 'non sparking' device that tends to give a superior output due to the reduced design constraints imposed by the design standard. The EEx N restrictions are less onerous than those of EEx d and the input power restriction of the entire installation of EEx N are higher than those of intrinsically safe installations, resulting in a louder sounder and brighter beacon. The units themselves are considerably less expensive to buy and installation costs and time taken to fit are reduced.

All products suitable for hazardous area use must be third party approved by a notified body. The assessment and categorization of a potentially hazardous environment must be undertaken by a competent person and or notified body. **IFP**

Pic courtesy of E2S

Compartmentalis

Pic courtesy of Eurobond

Richard Wigley, Business Development & Marketing Manager for Eurobond, looks at pre-finished panel systems, and explains why, when it comes to the provision of fire-rated internal partition walls, they are rivalling traditional methods.

By Richard Wigley

Business Development & Marketing Manager, Eurobond

Fire-rated compartmentation walls have become a key consideration in both new and existing premises since the Regulatory Reform [Fire Safety] Order (FSO) came into effect last year. The FSO states that the risk of fire should be reduced to 'as low as is reasonably practicable' and this in turn has led to a renewed focus on passive, as well as active, safety measures. Fire-rated compartmentation walls are an effective means of limiting the spread of fire, and also life threatening smoke.

Pre-finished panel systems have always been used extensively within warehouse or retail constructions. More recently, we have also seen a move towards their use in public buildings, such as schools and hospitals as more specifiers recognise the key advantages such systems have over more traditional routes of metal stud and board, for example.

When you consider the different stages of erection there are for stud and board in particular, the reasons for this differential soon become clear. Typical construction will entail fixing galvanised steel studs with two layers of fire resistant board each side, followed by a plaster skim coat and, generally, one mist and two full coats of emulsion – a lengthy process when you take drying times into account.

Compare this to pre-finished panel systems, which are remarkably easy to install with no specialist skills required. Steel channels are simply fixed to the floor and ceiling and the pre-cut panels slotted into place. An interlocking joint detail on each panel means there is no need to seal any joints, so no wet trades are required on site. Openings for doors or internal windows can be easily cut out and fixtures slotted into place.

This saving in time is significant – on average pre-finished panel systems, such as Eurobond's Firemaster can be constructed over 10 times quicker than blockwork or stud and board walls.

Ikea has certainly been switched onto the benefits of pre-finished panel systems. The Aston-under-Lyne's new Ikea store was partitioned using the Eurobond Firemaster System. The construction programme was extremely tight, just ten months, and so ease of installation was key to the specification.

Insulated Construction Limited used Eurobond Firemaster Wall Lite and Firemaster Wall Extra panels for the compartmentation of the four-storey warehouse and showroom facility, as they are easy to handle and install, so particularly contractor-friendly.

ing the Issues

Pic courtesy of Eurobond

The major benefit of pre-finished panel systems is that these time and cost savings can be made without compromising on other key performance characteristics.

For example, wall panels from the Eurobond Firemaster Range have achieved a BS 5234-2: 1992 Severe Duty Rating, in relation to partition wall strength and robustness.

The wall panels perform exceptionally well under tests that determine panel stiffness and resistance to small hard body impact, multiple large soft body impact, door slamming and crowd pressure. On all counts, the Firemaster panels sustain little or no damage, well below the deflection levels allowed.

The tests are carried out by CERAM, a UKAS accredited laboratory, on a 70mm thick Firemaster Panel, the lowest strength panel in the range. Severe Duty is the top rating achieved by conventional built up stud and board partitions, demonstrating Firemaster's suitability as an alternative to traditional means.

Firemaster panels have also been tested to BS476 Part 22, for fire resistance and assessed to LPS1208 to satisfy the fire resistance requirements for compartmentation in the LPC "Red Book" Design Guide.

LPS 1208 tests in relation to the fully developed or post-flashover stage of a fire. This is the phase of the fire where all the contents in the room, or in the vicinity of the fire origin, are fully involved and burning. Meeting this fire resistance requirement is vital for preventing fire spread via any combustible products that may be contained within the wall construction.

This superior fire performance is met due to the panel's mineral wool core, a non-combustible material rated Euroclass A1 – the highest European classification available.

This was particularly important for the new Macrae Food Group facility in Livingston, which produces high quality chilled seafood for the UK market. Opened earlier this year, it marked the biggest ever investment to date by owners Young's Seafood. Approximately 12000m^2 of Eurobond Firemaster panels were installed consisting of 100mm thick Firemaster wall, 100mm thick Firemaster wall extra and 150mm thick Firemaster ceilings.

Paul Walmsley, from contractors Central Insulation Limited, said: "Eurobond Firemaster products met the high performance requirements for the project and the 1 hour and 2 hours fire rating required by local authorities and insurers."

Panels manufactured from a mineral wool core also offer superior performance when it comes to smoke toxicity. In most cases of fire it's not actually the flames, but the smoke and toxic fumes that pose a threat. The most common identified cause of death or injury in a fire is being overcome by gas or smoke (accounting for 44% of all fire deaths and 33% of all non fatal casualties in 2005), so understanding any threat posed by toxic smoke is vital.

Recent independent fire tests by the Warrington Fire Research Centre do provide specifiers with an indication of the levels of toxic smoke produced by composite panel cores, manufactured from Polyisocyanurate (PIR) and Rockwool. The tests monitored the levels of the key dangerous substances carbon monoxide (CO) and hydrogen cyanide (HCN).

Test Results – Irradiance level 50kW/m^2 in the absence of a pilot flame

	CO	HCN
Polyisocyanurate (PIR)	1533ppm	72ppm
Rockwool	307ppm	4ppm

Pic courtesy of Eurobond

Pre-finished panel systems also allow for easier re-configuration of a building space. If the building owner ever wishes to move any partition wall the panels can simply be taken out, the wall and ceiling channels moved and the panels fixed back in. Under the same circumstances a stud wall would have to be demolished and the waste disposed of, which would be messy and disruptive, and not ideal for those wishing to limit their environmental impact.

The environment is, of course another consideration when it comes to specifying any building material and pre-finished steel faced, mineral wool cored panels can also contribute positively to this duty of care.

Eurobond's Firemaster, for example, has a low environmental impact, with a carbon footprint significantly lower than that of an equivalent panel with a polyisocyanurate [PIR] core.

Firemaster can also be part of a closed loop recycling process in that both the steel and mineral wool can be used to make new product. With an increased focus on the disposal options available at the end of a building's useful life, Firemaster is one of the only internal panel products that is truly recyclable, further minimising its overall environmental impact.

The benefits of pre-finished panel systems aren't just confined to the build itself. When it comes to on-going maintenance, panels manufactured from galvanized polyester-coated steel sheets can simply be washed down, so there is no need for cyclical painting programmes.

Specifiers trying to juggle the demands of meeting regulations, tight budgets and deadlines, should carefully consider panel systems when specifying internal partition walls, as studies have proven that they can deliver a fast and effective means of achieving all levels of fire resistance. IFP

Pic courtesy of Eurobond

For further information on Eurobond Laminates:
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The technical argume in road tunnels do no

Several series of experiments of sprinklers in road tunnels have been carried out in recent years. The results show that water mist type sprinkler systems are effective, and that most arguments against the use of sprinklers do not stand up. Photo courtesy of Marioff Corporation Oy

By Haukur Ingason and Magnus Arvidson

SP Technical Research Institute of Sweden, Department of Fire Technology

Interest in the use of sprinkler systems in road tunnels has increased in recent years as a result of the major tunnel fires that have occurred in the last few years and of the good results from experiments with new sprinkler technology. Nevertheless, despite this, the installation of sprinklers in new tunnels is far from settled. A review of the literature, carried out by SP Technical Research Institute of Sweden, shows that many of the technical arguments against the use of sprinklers in road tunnels do not stand up.

Japan has over 80 road tunnels with sprinkler systems, as against only about a dozen tunnels with such systems in the whole of the rest of the world. One possible explanation for this is to be found in a number of technical arguments against the use of sprinklers: arguments that are even documented in the latest editions of PIARC and NFPA 502, the two international publications that are most used in connection with fire safety in road tunnels.

Historical experiments in Switzerland

The background to several of the arguments against sprinklers is to be found in the fire experiments that were carried out in the Ofenegg tunnel in Switzerland over 40 years ago. Interpretation of the results of these experiments has probably been decisive in determining the limited use of sprinklers in tunnels. The experiments were carried out with pans of petrol, of varying sizes, in a relatively small tunnel. The tunnel had a cross-sectional area of 23 m^2, was 190 m long and had only one entrance/exit. The sprinkler system used in the experiments did not incorporate foam admixing. In all the experiments, the sprinklers extinguished the fire, but the fire gases were quickly driven down to floor level when the system was activated and the short tunnel was entirely filled with smoke. In addition, a deflagration occurred in the last experiment, 20 minutes after extinguishing, when explosive fumes from the petrol were re-ignited. The results also included scalding, i.e. burns damage to organic materials caused by steam. In addition, the steam moved the fire gases further into the tunnel, causing temperatures there that were higher than in the experiments without the use of sprinklers. Since this, the results from these experiments have been used as arguments against the use of sprinkler systems in road tunnels.

Further negative arguments have been put forward since those experiments were carried out in 1965, such as the risk of the sprinkler water carrying floating fuel along the road and thus increasing the size of the fire, the limited ability of sprinklers to deal with fires inside vehicles, the risk of secondary accidents due to unintentional activation, the risk of frost damage and high maintenance costs. Most of these arguments originate

nts against sprinklers t stand up

from discussions between experts, rather than on direct experience from experiments.

New experiments – new knowledge

The experiments of sprinklers that have been performed in recent years (water mist, conventional sprinkler systems and foam sprinkler systems) show that all such systems restrict the spread of fire and radically reduce temperatures. Experiments have been carried out both on liquid fires and on large and small vehicles. In all cases, the experiments tunnels have been longer than the Ofenegg tunnel, with greater cross-sectional area. Admittedly, the fire gases have been pressed down towards the road surface when the systems were activated, but only in the vicinity of the fire. In this context, it is important to point out that longitudinal ventilation also presses the fire gases down towards the road surface downstream of a fire. No signs of scalding have been observed, and nor have temperatures in other areas been higher. However, experiments involving liquid fires have been carried out using pans, which means that it has not been possible to determine whether the water would spread the fuel. Nevertheless, using foam, liquid fires have been extinguished very effectively, with the blanket of foam preventing re-ignition.

Many years' experience of sprinklers in road tunnels in Japan

Many experiments of sprinklers in road tunnels have been carried out in Japan, with the result that sprinklers have been recommended for use in tunnels longer than three kilometres and carrying more than 4000 vehicles per day. The accumulated experience is very favourable, with sprinklers having prevented major fires in several cases and without causing any problems with evacuation. No cases of accidental activation or negative effects of sprinkler systems have been reported. The smoke from fires in those cases where the system has been activated has been pressed down towards the ground only in the vicinity of the fire.

The fire in Melbourne – a concrete example

A fire occurred in a tunnel in Melbourne on 23rd March 2007 as the result of a collision between two heavy goods vehicles and two cars. This tunnel is one of the few tunnels outside Japan that actually has a sprinkler system. The fire could have had catastrophic consequences. However, as the fire gas ventilation system and the sprinkler system (a group activation system) were activated at an early stage, and as the fire and rescue services quickly reached the scene, all those in the tunnel were able to escape from it without any injuries. The tunnel was in fact back in use after only four hours.

Fires in modern private cars can be extremely fierce if they involve several vehicles, or if petrol or diesel fuel leaks out onto the road. Photo courtesy of Marioff Corporation Oy

New guidelines in NFPA 502

The present edition of NFPA 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways', includes several negative comments on sprinklers in tunnels. These comments will still be in the next edition, but will be complemented by an explanatory text explaining why they are no longer valid. Another important change is that the design fire rating of fires in heavy goods vehicles will be increased to 70-200 MW, as against the previous 20-30 MW. This means that the expected consequences of a fire are greater, making the installation of sprinklers more beneficial. The new edition of NFPA 502 will be published in September 2007.

Time to think again. . .

There is no well-supported technical argument against the use of sprinkler systems in road tunnels. The only argument that can be considered is that of investment and maintenance costs. However, seen in a larger context, and thus including the costs of fire damage, standstill costs and deaths and injuries, it is likely that the cost of a sprinkler installation can be justified, at least in road tunnels carrying high volumes of traffic.

SP Report 2006:56 (may be downloaded from www.sp.se) includes the entire literature list. In addition, it presents the results of 1:23 model scale experiments using water sprinklers, and investigating the effects of basic parameters such as air velocity, heat release rate and water flow. IFP

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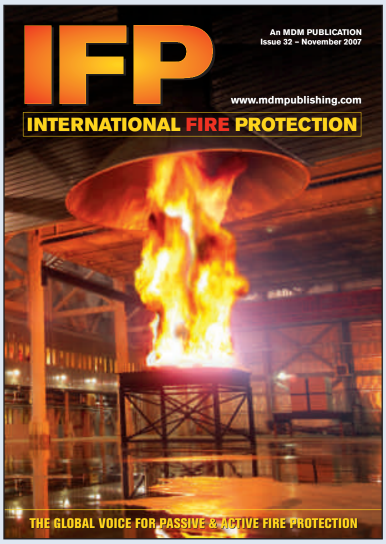

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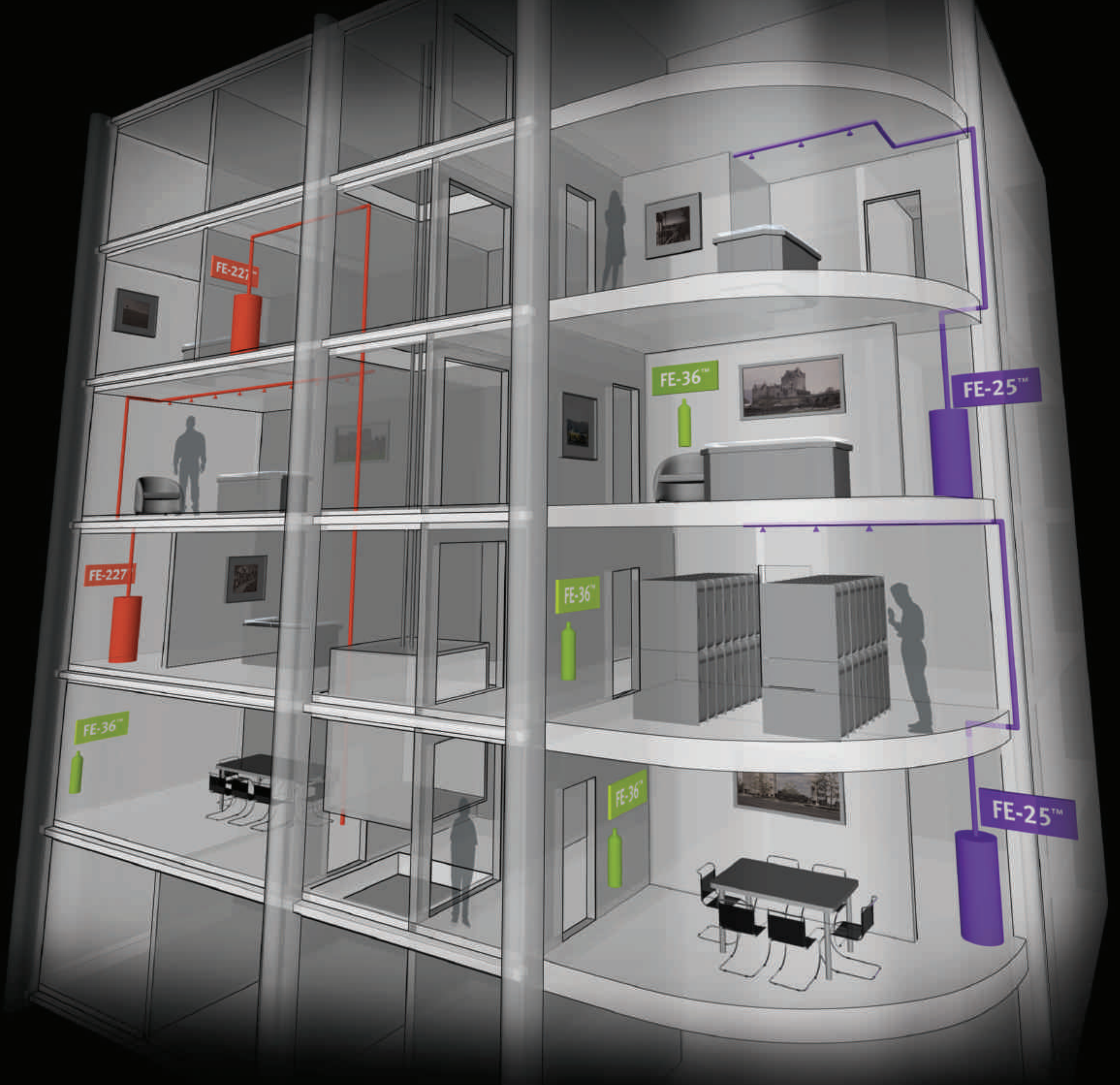

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